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ABSTRACT

The purpose of this curriculum guide is to help teachers implement the Alabama Course of Study: Science. The major emphasis of the guide is to provide student-oriented, hands-on activities that engage students in "sciencing" behaviors. This guide has to major components, the table of contents and the activities. The table of contents lists by Roman numeral the units covered in grade 2. Each unit is organized into topics that describe further the content of the grade level. The smallest organizers in the table of contents are the student outcomes that describe in detail what students are expected to learn about each topic. After each outcome, one or more page numbers direct the reader to a classroom activity (or activities) that addresses the specific outcome. The second and largest component of the guide consists of classroom activities. Each activity begins with identifiers that summarize and introduce the activities. The identifiers are the Unit, Topic, and Outcome(s) addressed by the activity. Each activity contains a background section that provides teachers with information they may need to teach the activity effectively. Following the background, all materials needed for the activity are listed in a section entitled "Materials." Procedures for implementing the activity are outlined next. In some cases, extensions of an activity or source for an activity appear after the section on procedures. Units include the following: (1) "Animals"; (2) "Plants"; (3) "Air"; (4) "Water and Oceanography"; (5) "Weather"; (6) "Heat and Light"; (7) "Magnets"; (8) "Matter and Energy"; and (9) "Contributions and Careers in Science." (KR)

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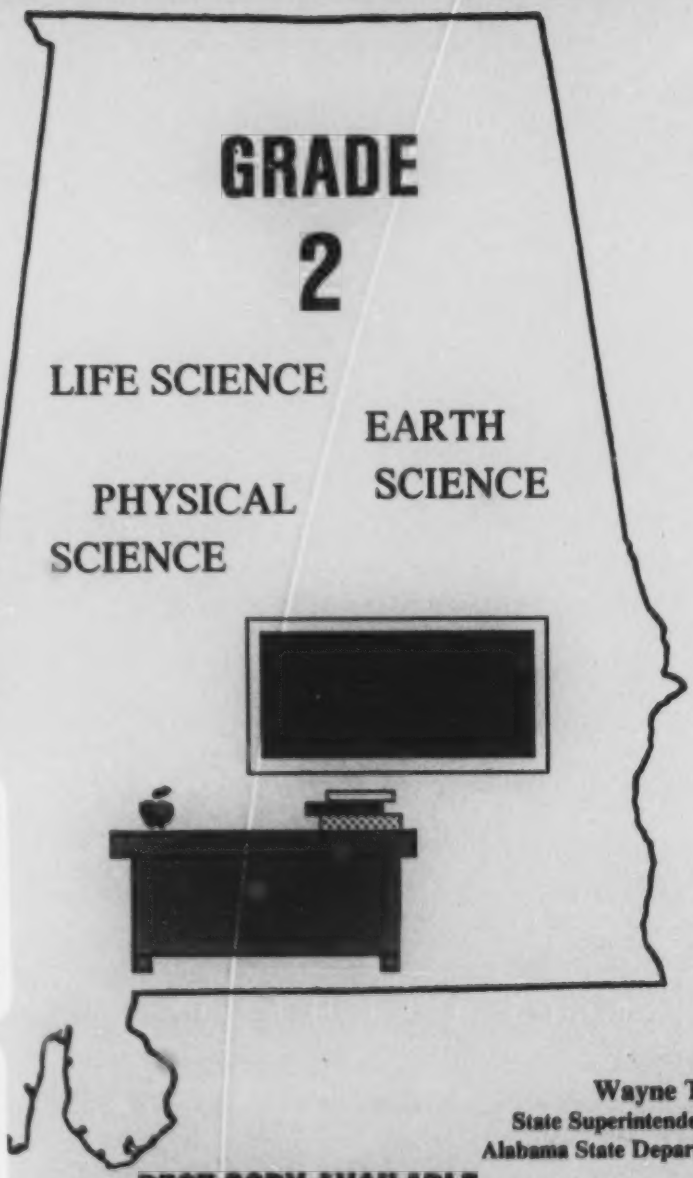

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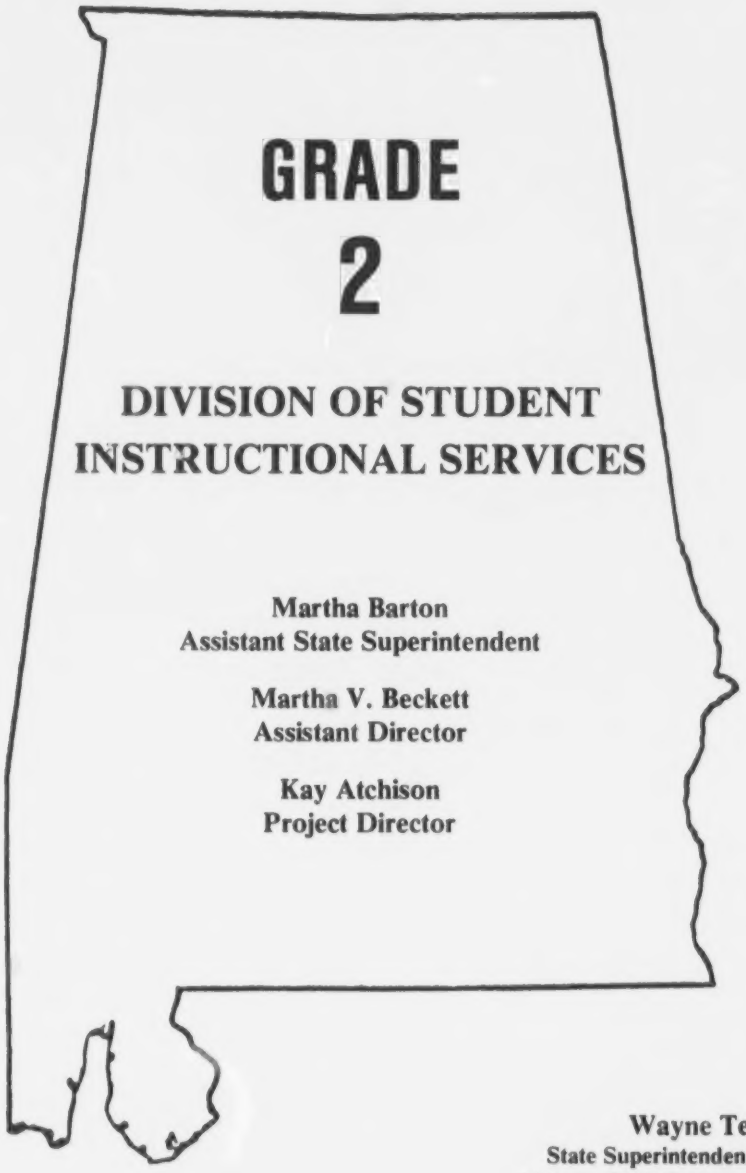

GRADE 2

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Bulletin 1989, No. 72

INTRODUCTION

The science curriculum guides consist of nine documents, one for each grade kindergarten through grade eight. The purpose of these curriculum guides is to help classroom teachers implement the Alabama Course of Study: Science (Bulletin 1988, No. 35). The major emphasis of each guide is to provide student-oriented, hands-on activities that engage students in "sciencing" behaviors.

The science curriculum guides have two major components, the Table of Contents and the activities. Each guide begins with the Table of Contents that lists by Roman numerals the units covered at a grade level. Each unit is organized into topics that describe further the content of the grade level. The smallest organizers in the Table of Contents are the student outcomes that describe in detail what students are expected to learn about each topic. After each outcome, a page number(s) directs the reader to a classroom activity (or activities) that addresses the specific outcome.

The second and largest component of the guide consists of classroom activities. Each activity begins with identifiers that summarize and introduce the activities. These identifiers are the Unit, the Topic, and the Outcome(s) addressed by the activity. Each activity contains a Background that provides teachers with information they may need to teach the activity effectively. Following the Background, all materials needed for the activity are listed in a section entitled Materials. Procedures for implementing the activity are outlined next. In some cases, extensions of an activity or sources for an activity appear after the Procedures.

The science curriculum guides are supplemental in nature. They were created to complement and enrich locally-developed science curriculum plans and to provide instructional resources for all topics named in the Alabama Course of Study: Science. Consequently, each activity in the curriculum guide stands alone and does not need to be taught in the order in which it appears in the document. It is expected that local education agencies will sequence the activities in this guide to correspond with the order in which topics are outlined in their locally-developed scope and sequence for science.

ACKNOWLEDGEMENTS

From its inception, the development of curriculum guides has been viewed as a cooperative effort between specialists in the Division of Student Instructional Services and selected teachers from public schools in Alabama. While the Curriculum Development Section, under the leadership of Katherine Mitchell, had the responsibility for coordinating the project, approximately 75 educators contributed directly to the science curriculum guides.

Work on the science curriculum guides started in the fall of 1988 when Kay Atchison was selected as Project Director for grades K-6 and Donna Bentley was named Project Director for grades 7 and 8. The second phase of the project involved the recruitment and training of approximately 35 classroom teachers and university instructors who wrote activities for the guides. For six months (December 1988 through May 1989) writers created activities to address specific outcomes, and the State Department of Education staff typed, edited, and proofread numerous drafts of the activities.

The contributions of persons and institutions listed below are greatly appreciated.

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GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Kinds of Animals
OUTCOME: 1. Describe a variety of animals, and compare them for similarities and differences.

Background

A visit to the zoo gives students a vivid picture of the variety of animals on Earth. Students observe immediately the likenesses and differences in animals. Some prior knowledge of the main vertebrate groups may enhance the interest level of students. Allow one day for motivation and development of prior knowledge. Allow one day for the field trip and one day for follow-up activities.

Materials

- Storybook about animal families
- Drawing paper
- Crayons
- Handout: ZOO TRIP GRAPH

Procedures

Day One

1. Read a book to the students about animal families.
2. Discuss characteristics of different animal groups similar to the following:
   a. Mammals have hair or fur and give birth to live young. (Bats and whales are mammals.)
   b. Reptiles have dry, scaly skin and are cold-blooded.
   c. Birds have feathers and lay eggs.
   d. Fish live in water and breathe with gills.
   e. Amphibians live on land and in the water.
3. Direct students to look for animals with the various characteristics during the visit to the zoo.

Day Two

1. Divide students into five groups. Name the groups after the five vertebrate groups: mammals, reptiles, birds, fish, and amphibians.
2. Transport students to the zoo.

OUTCOME 1 (Continued)
Procedures (Continued)

3. Direct students in each group to count the kinds of animals bearing the name of their group.

Mammal Group	Reptile Group	Bird Group
kangaroo	snake	peacock
bear	alligator	eagle
lion	lizard	owl
elphant	turtle	sparrow
deer		crane
5 kinds of mammals	4 kinds of reptiles	5 kinds of birds

Fish Group	Amphibian Group
goldfish	frog
shark	toad
guppy	salamander
catfish	
snapper	
flounder	
6 kinds of fish	3 kinds of amphibians

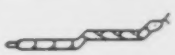
Day Three

Have students complete the handout ZOO TRIP GRAPH.

OUTCOME 1 (Continued)

ZOO TRIP GRAPH
Handout

Directions: Graph the number of each animal group you saw at the zoo.

16					
15					
14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
					
	mammals	reptiles	birds	fishes	amphibians

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Kinds of Animals
OUTCOME: 1. Describe a variety of animals, and compare them for similarities and differences.

Background

Animals need air, water, food, and shelter. Animals experience cycles of growth and reproduction. Animals differ in size, type of body covering, type and number of appendages, skeletal structure, eating habits, and habitats. The following activities acquaint students with a large variety of animals on Earth and provide the experience of comparing the animals for similarities and differences. Collect a number of pictures of different animals in order that each student may have one or more types of animals depicted.

Materials

- Animal pictures
- Chalkboard
- Glue

For each student:

- Handout: ANIMAL DESCRIPTIONS

Procedures

1. Use a demonstration similar to the following to begin a discussion of how people are alike and different:

   a. Have four to six students come to the front of the classroom. Choose students of different sizes with varying hair colors, clothes, and shoes.

   b. Have students state their names. Then ask, "By what name can we identify this whole group?" Lead students to conclude that they are all children. Write the heading Children on the chalkboard.

   c. Have students tell how these children are alike. List the characteristics on the chalkboard under the category Alike.

   d. Have students identify differences. List the characteristics on the chalkboard under the category Different.

Children	
Alike	Different
8 years old	hair color

OUTCOME 1 (Continued)
Procedures (Continued)

2. Have students complete the following sentence: All children are (alike in some ways and different in other ways).

3. Lead students in a discussion about animals by asking "Are all animals on Earth alike?" (Students will probably answer no.)

4. Continue with questions similar to the following: "In what ways are animals alike?" "Different?"

5. Show various animal pictures. Have students identify animals and tell how they are different.

6. Distribute the handout ANIMAL DESCRIPTIONS to each student.

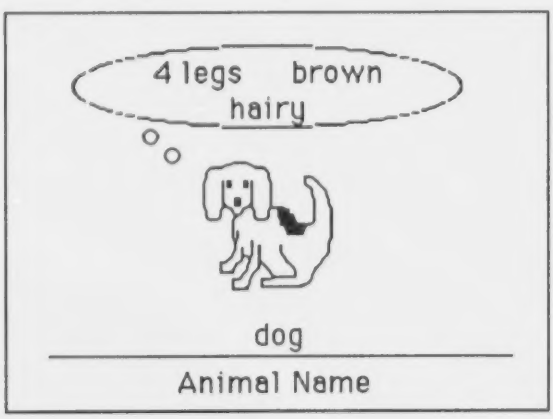
7. Pair students. Instruct students to:

   a. Choose an animal picture.

   b. Glue the animal picture below the bubble on the handout ANIMAL DESCRIPTIONS.

   c. Write the animal's name on the line at the bottom of the handout.

   d. Write descriptive words in the bubble (the thought balloon) on the handout.



8. Have students place the completed animal descriptions on a bulletin board.

9. The following day, have students play the game "I Spy" by using the animal pictures on the bulletin board. Provide the following directions:

I SPY

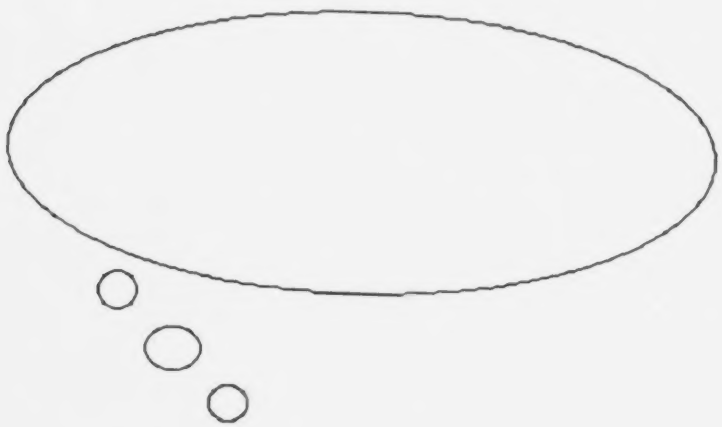
Select a student to describe an animal from the pictures on the bulletin board. Have the student give a description of the animal similar to the following: "I spy an animal that has scales, lives in the water, and breathes with gills." Let the class guess the described animal. (Fish)

Allow the student who guesses correctly to describe the next animal. Continue the game until all animals have been described.

OUTCOME 1 (Continued)

ANIMAL DESCRIPTIONS
Handout

Directions:
1. Choose an animal picture.
2. Glue the animal picture below the bubble.
3. Write the animal's name on the line at the bottom of the handout.
4. Write descriptive words in the bubble (the thought ballon) on the handout.



_____
Animal Name

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Kinds of Animals
OUTCOME: 1. Describe a variety of animals, and compare them for similarities and differences.

Background

The five main vertebrate groups are mammals, reptiles, amphibians, fish, and birds. Vertebrate groups comprise a major portion of the large variety of animals on Earth.

Prepare the cards ANIMAL DESCRIPTIONS by writing the descriptions of animals (on page 16) in each of the five vertebrate groups on poster board. Collect pictures of a variety of different animals representing the five main vertebrate groups. Mount the pictures on cards cut from poster board. Introduce one group of animals per day.

Materials

- Cards: ANIMAL DESCRIPTIONS
- Animal pictures
- Poem: ANIMAL FAMILIES
- Poster board
- Scissors
- Glue
- Chalkboard

Procedures

Day One

1. Have a student choose an animal description card. Write the description on the chalkboard.

2. Read or have a student read the description to the class.

3. Display several mounted animal pictures on the chalk tray.

4. Ask students to choose animal pictures that best fit the description. Have students tell how each animal chosen fits the description.

5. Have students copy and illustrate the description.

Days Two through Five

1. Continue the same procedure until the five main animal groups have been introduced.

OUTCOME 1 (Continued)
Procedures (Continued)

2. When all groups have been introduced, have students discuss the likenesses and differences among the groups.

3. Compile the five days of illustrations into individual animal family scrapbooks.

Extensions

Review characteristics of animals with the poem ANIMAL FAMILIES.

Read the poem. Have students join in the refrain after each verse. Ask students to name the vertebrate groups described in the verses.

Have students write and illustrate their own poems about animals.

OUTCOME 1 (Continued)

ANIMAL DESCRIPTIONS
Cards

	(Birds) 1. They have feathers. 2. They lay eggs. 3. They have beaks. 4. They are warm-blooded. 5. Most of them fly.
(Mammals) 1. They have hair or fur. 2. They are warm-blooded. 3. The babies are born alive. 4. The babies get milk from their mothers. 5. They breathe with lungs.	(Amphibians) 1. They have moist skin. 2. They lay eggs. 3. As babies, they live in water, but as adults, they live on land.
(Reptiles) 1. They have dry, rough skin and scales. 2. They are cold-blooded. 3. They lay eggs. 4. They breathe with lungs.	(Fish) 1. They have wet, scaly skin. 2. They breathe with gills. 3. They live in water.

ANIMAL FAMILIES
Poem

On the earth with us today
are animals of every sort;
big, flying, hairy, long,
black, striped, short.

Refrain:

Five groups are they
one, two, three, four, five
five groups are they
Animals. Sakes alive!

One group has hair, no eggs to hatch
their babies are born alive;
dogs, whales, bats, and bears,
Aunt Sue, Uncle Tim, you, and I.

This group has fins and breathes with gills
In water they make their homes;
sharks, barracudas, rainbows, swords
They're the largest group with bones.

There is a group of fine-feathered friends
with beaks and wings for flight;
bluejays, ducks, penguins, hawks,
and the eagle with terrific sight.

This group's body temperature
goes down when the temperature is down;
snakes, lizards, turtles, crocodiles,
And dinosaurs, when they were around.

Our last group has smooth, moist skin
lives first in water and later on land;
toads, salamanders, and newts,
breathes air with lungs, as you and I can.

I'm happy that animals live on our earth.
They make every day such fun!
They're alike but oh so different
I love them everyone.

by Margaret Allen

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Adaptation to Their Environments
OUTCOME: 2. Observe and describe characteristics of animals in various environments.

Background

Animals live almost everywhere on Earth. The kind of animal that inhabits a certain environment is one that is suited to that environment and has adapted well to its surroundings. Animals have special body features that help them adapt to their environments.

Materials

- Animal pictures: polar bear, fish, kangaroo rat, chameleon, camel, duck, beaver
- Various kinds of environmental pictures: desert, woodlands, tundra, ice floe, ocean
- Chalkboard

For the desert terrarium environment group:

- Large jar with screw-on cap (holes punched in the cap)
- Sand (enough to cover bottom when jar is on its side)
- Small potted cactus plant
- Rocks
- Small bottle cap
- Small piece of driftwood

For the woodland, swamp, or grassland terrarium environment group:

- Large jar
- Pebbles (enough to cover bottom of jar)
- Small bits of charcoal
- Soil
- Small plants
- Plastic wrap
- Rubber band

For each group:

- Handout: CONSTRUCTION OF ENVIRONMENTS

Procedures

1. Lead students on a nature walk around the school neighborhood. Have students look for animals in the environment. Stop to observe animals.

OUTCOME 2 (Continued)
Procedures (Continued)

2. In the classroom, have students list on the chalkboard the names of the animals observed on the nature walk and answer questions similar to the following:

   a. What do the animals eat?

   b. Where do the animals live?

   c. Why can the animals survive in their environments?

3. Show pictures of various kinds of environments. Ask questions similar to the following:

   a. Does this environment have a warm or cold climate?

   b. What kind of animals would live here?

   c. Would a (animal name) survive in this environment?

   d. Where would a (animal name) obtain food if it lived here?

4. Explain to students that most animals' body structures conform to their surroundings.

5. Show the following animal pictures, and have students give the characteristics of each animal. Ask students to guess the environment of each animal.

   a. Polar bears have heavy coats and excess fat for survival in cold, polar regions. (Snow and ice, tundra)

   b. Fish can take in oxygen from the water through their gills. (Ocean)

   c. Desert kangaroo rats give off body heat through their tails. (Desert)

   d. Chameleons have protective coloration to confuse their enemies. (Woodlands)

   e. Camels can close their nostrils to avoid blowing sand from entering into their nostrils. Camels can drink great amounts of water at one time and store the water in their humps. (Desert)

   f. Ducks have webbed feet. (Pond)

   g. Beavers have tails like paddles. (Pond)

6. Have students suggest other examples.

OUTCOME 2 (Continued)
Procedures (Continued)

7. Divide the class into two groups. Name one group the desert terrarium environment group, and name the other group the woodland, swamp, or grassland terrarium environment group. Have the two groups of students construct environments for animals by using the instructions on the handout CONSTRUCTION OF ENVIRONMENTS.

8. Discuss with students what kinds of animals live in these environments.

CONSTRUCTION OF ENVIRONMENTS
Handout

TERRARIUM
(Desert)

Lay a jar on its side (the side now becomes the bottom). Put enough sand in the jar to cover the bottom. Plant a small cactus plant in the sand. Add rocks, a small piece of driftwood, and a small bottle cap to hold water in the terrarium.

TERRARIUM
(Woodland, Swamp, Grassland)

Cover the bottom of a large upright jar with pebbles. Add small bits of charcoal and soil. Place small plants in the terrarium. Cover the top of the jar with plastic wrap. Secure the plastic wrap with a rubber band.

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Adaptation to Their Environments
OUTCOME: 2. Observe and describe characteristics of animals in various environments.

Background

Many animal habitats exist on Earth. Animals use trees and plants for food and shelter. Samples of animal habitats include the following: trees, underbrush, forest floor, soil, and water. Most animals are suited for their environments.

Materials

- Environmental pictures: woodland, pond, ocean, and desert
- Magazines
- Bulletin board paper
- Glue
- Scissors

Procedures

1. Display pictures of woodland, pond, ocean, and desert environments.

2. Have students tell which animals are best suited to the various environments. To encourage discussion, ask questions similar to the following:

   a. What does the animal eat?

   b. Where does the animal obtain food?

   c. How does the animal obtain food?

   d. How does the animal move?

   e. Would the animal be able to obtain food and move about in any environment?

   f. What protects the animal from enemies?

   g. Would the animal have the same protection in any environment?

   (Lead students to the appropriate conclusion that animals are suited for certain environments.)

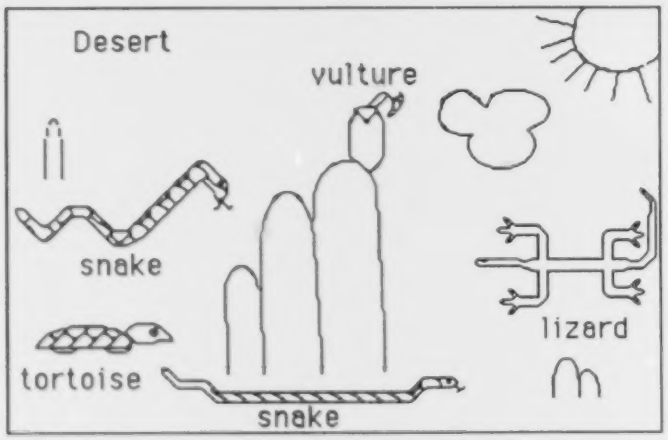
OUTCOME 2 (Continued)
Procedures (Continued)

3. Have students construct environmental murals. Assign five or six students to each environment, or let the class construct one environmental mural. Use instructions similar to the following:

   a. Draw or cut animal pictures from magazines.

   b. Glue the pictures on bulletin board paper.

   c. Draw or cut from magazines pictures of animal homes and plant life to simulate a certain environment.



DESERT ENVIRONMENT

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Interdependence of Plants and Animals
OUTCOME: 3. Observe animals and plants that depend upon each other.

Background

All living things need food and shelter in order to survive. Plants and animals are interdependent in that the survival of one depends on the existence and/or availability of the other. Animals feed on plants and other animals and use plants for shelter. Plants, on the other hand, are fertilized by the waste of animals and receive from animals carbon dioxide necessary for their food-making process. A food chain is the flow of energy from producer to consumer in a community. A food web is a diagram that shows overlapping relationships of many food chains. A food web is an excellent example of this interdependency.

Prior to the activity, cut the FOOD WEB illustrations from flannel and draw the details with markers. Prepare the FOOD WEB cards on poster board.

Materials

- Flannel board
- Diagram: FOOD WEB
- Illustrations: FOOD WEB
- Cards: FOOD WEBS
- Key: FOOD WEBS
- Flannel
- Markers
- Scissors
- Poster board

Procedures

1. Use the flannel board, flannel illustrations, and the following story to explain how animals use plants and other animals for food. Explain how the process creates a food web.

   Tell the following story:

   This is the sun that gives heat and light energy to the earth. (Place the sun illustration on the flannel board.)

   These are the plants that grow under the sun, that gives heat and light energy to the earth. (Place the plant illustration on the flannel board.)

This is the butterfly that eats the plants, that grow under the sun, that gives heat and light energy to the earth. (Place the butterfly illustration on the flannel board.)

This is the dragonfly that eats the butterfly, that eats the plants, that grow under the sun, that gives heat and light energy to the earth. (Place the dragonfly illustration on the flannel board.)

This is the frog that eats the dragonfly, that eats the butterfly, that eats the plants, that grow under the sun, that gives heat and light energy to the earth. (Place the frog illustration on the flannel board.)

This is the snake that eats the frog, that eats the dragonfly, that eats the butterfly, that eats the plants, that grow under the sun, that gives heat and light energy to the earth. (Place the snake illustration on the flannel board.)

This is the eagle that eats the snake, that eats the frog, that eats the dragonfly, that eats the butterfly, that eats the plants, that grow under the sun, that gives heat and light energy to the earth. (Place the eagle illustration on the flannel board.)

2. Ask questions similar to the following:

   a. What ate the snake? Frog? Dragonfly? Butterfly? Plants?

   b. If frogs ate only dragonflies, what would happen to the frogs if there were no more dragonflies on the earth?

      (Lead students to the appropriate conclusion that the frog would die. This would happen to any animal that depends on one source of food that is eliminated from the animal's environment.)

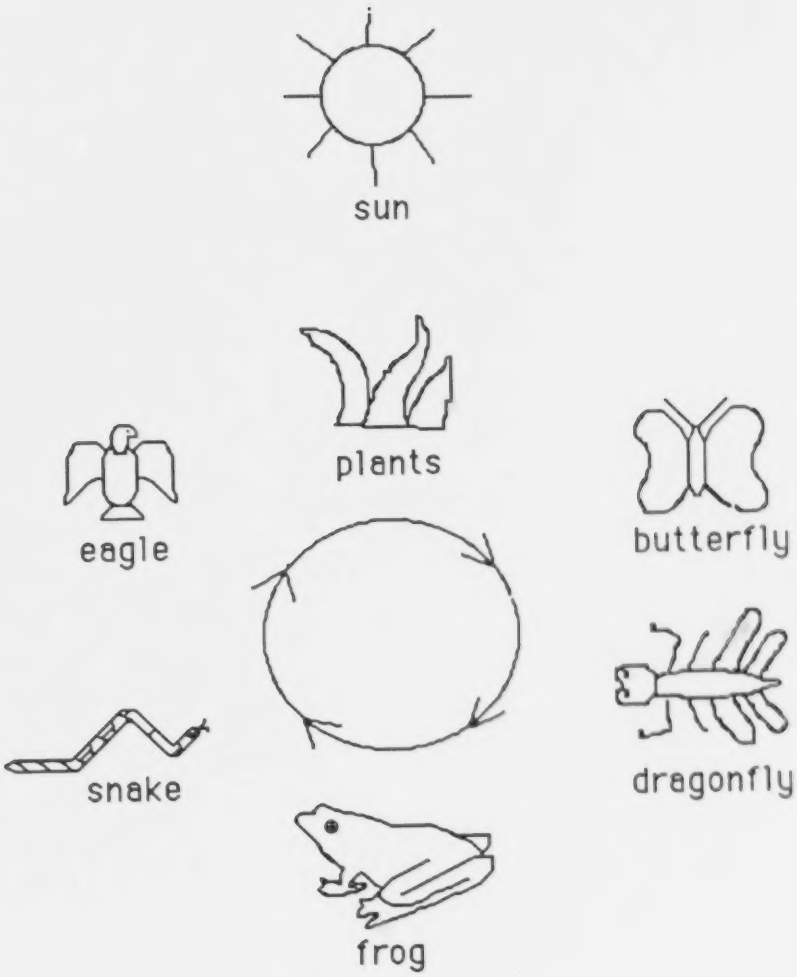
3. Tell students to make food webs. Give students animal and plant names. Instruct students to decide which animal comes first by trying different combinations. Complete an example.

4. Have a student shuffle the FOOD WEB cards. Have a student draw from the stack, read the animal and/or plant names, and suggest an order.

5. Direct students to make other food webs to include human beings. Discuss how humans are interdependent on plants, animals, and each other.

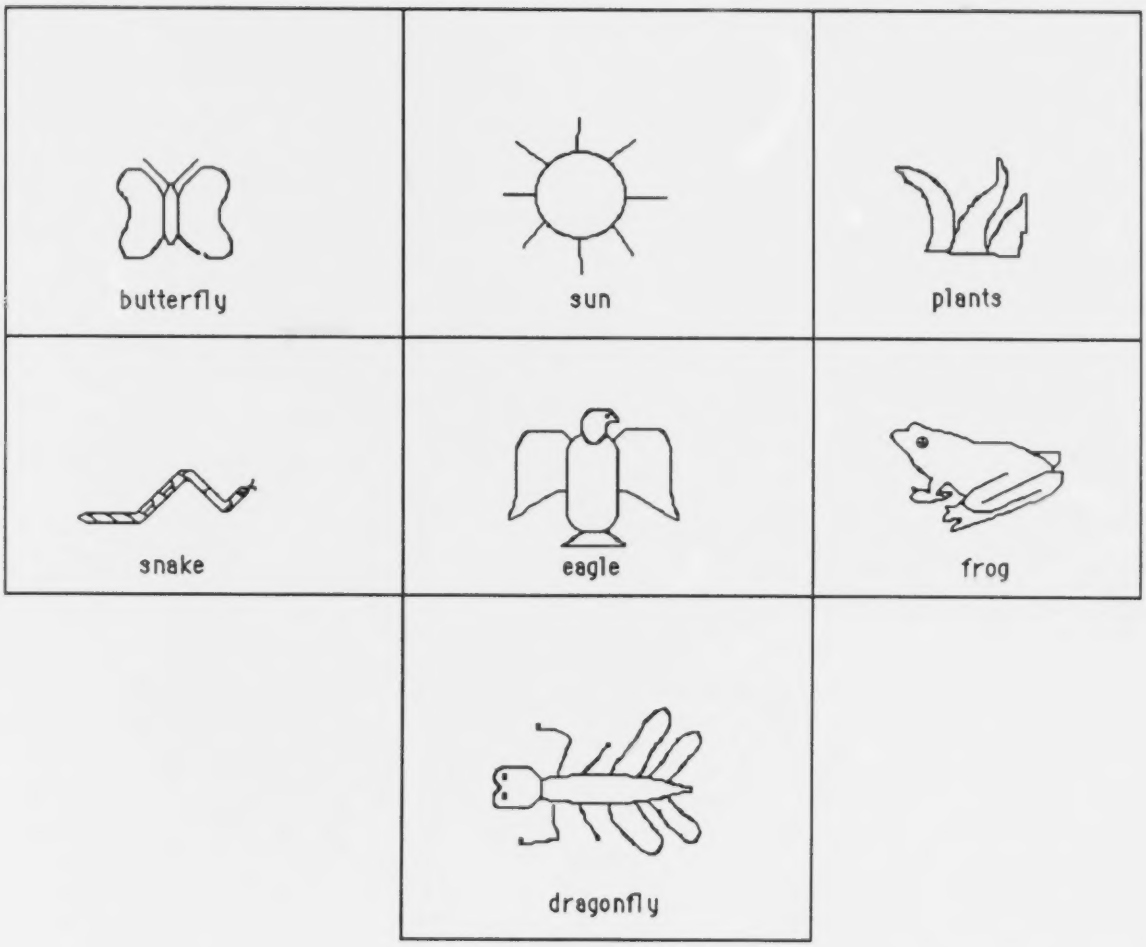
OUTCOME 3 (Continued)

FOOD WEB
Diagram



OUTCOME 3 (Continued)

FOOD WEB
Illustrations
(Cut)



OUTCOME 3 (Continued)

FOOD WEBS
Cards

1 PLANTS, OWL, MOUSE	2 RABBITS, PLANTS, OWLS
3 MOUSE, SNAKE, PLANTS	4 RABBIT, PLANTS, MAN
5 HAWK, DRAGONFLY, PLANTS	6 SNAKE, BUTTERFLY, FROG

OUTCOME 3 (Continued)

FOOD WEBS
Key

1 PLANTS, MOUSE, OWL

2 PLANTS, RABBITS, OWLS

3 PLANTS, MOUSE, SNAKE

4 PLANTS, RABBIT, MAN

5 PLANTS, DRAGONFLY, HAWK

6 BUTTERFLY, FROG, SNAKE

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Endangered or Extinct Species
OUTCOME: 4. Identify animals that have become endangered or extinct.

Background

Identification of endangered animals is the first step toward keeping the earth's wildlife safe. This activity gives students insight into which animals are identified as endangered.

Materials

- Alphabet Code Chart

A-1	E-5	I-9	M-13	Q-17	U-21	Y-25
B-2	F-6	J-10	N-14	R-18	V-22	Z-26
C-3	G-7	K-11	O-15	S-19	W-23	
D-4	H-8	L-12	P-16	T-20	X-24	

- Pictures of endangered and extinct animals
- Library books with pictures of endangered and extinct animals
- Bulletin board

Procedures

1. Display the Alphabet Code Chart. Have students use the code to solve the following puzzles:

Animals That Are Extinct

a. 4-9-14-15-19-1-21-18 (Dinosaur)

b. 19-1-2-5-18-20-15-15-20-8-5-4
20-9-7-5-18 (Saber-toothed Tiger)

c. 16-1-19-19-5-14-7-5-18
16-9-7-5-15-14 (Passenger Pigeon)

d. 4-15-4-15
2-9-18-4 (Dodo Bird)

e. 7-18-5-1-20
9-18-9-19-8
5-12-11 (Great Irish Elk)

f. 7-18-5-1-20
1-21-11 (Great Auk)

OUTCOME 4 (Continued)
Procedures (Continued)

Animals That Are Endangered

a. 11-15-1-12-1 (Koala)

b. 23-8-1-12-5 (Whale)

c. 23-9-12-4
2-21-6-6-1-12-15 (Wild Buffalo)

d. 7-9-1-14-20
20-15-18-20-15-9-19-5 (Giant Tortoise)

e. 20-1-16-9-18
13-15-14-11-5-25 (Tapir Monkey)

2. Have students locate pictures of endangered or extinct animals. Use the pictures on a bulletin board for the identification of endangered or extinct animals.

Extensions

Read books to the students on endangered or extinct animals.

Take students to a museum that contains fossil exhibits.

Write a letter requesting the poster "Surrender or Survival." Use the address below:

Nature Conservancy
Communications Department
1800 N. Kent Street
Arlington, Virginia 22209

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Endangered or Extinct Species
OUTCOME: 4. Identify animals that have become endangered or extinct.

Background

Scientists suggest everything from the coming of the ice age and volcanic eruptions to meteoric explosions as causes for the extinction of early animals. Today, efforts are being made to keep many animals from becoming extinct. Endangered animals are being identified. Campaigns and laws are defending animals' survival. Identifying endangered animals is a step toward keeping pandas, leopards, and other wildlife safe from extinction.

Materials

- Pictures of extinct animals: dinosaur, dodo bird, passenger pigeon, great Irish elk, and saber-toothed tiger
- Pictures of endangered animals: koala, tamarin, jaguar, whale, wild buffalo, orangutan, rhinoceros, condor, eagle, and cheetah

Procedures

Part A: Extinct Animals

1. Show students pictures of extinct animals, such as dinosaurs, saber-toothed tigers, and great Irish elks.

2. Have students identify the animals.

3. Ask students if these animals can be found on Earth today. (Lead students to conclude that these animals are no longer living on Earth today.)

4. Explain the word extinct--no longer living on Earth.

5. Ask students what happened to the animals. Listen to the students' theories.

6. Explain that some of the reasons for extinction of animals are the following:

   a. Changes in the climate (temperature)
   b. Changes in vegetation (food)
   c. Frequency in killing (food, skins, sport)

OUTCOME 4 (Continued)
Procedures (Continued)

7. Ask students questions similar to the following:

   a. Can anything be done today to help extinct animals? (No)

   b. Why not? (Extinct means no longer in existence.)

Part B: Endangered Animals

1. Show students pictures of endangered animals, such as tamarins, wild buffalo, and koalas.

2. Have students identify the animals.

3. Ask students where the animals can be found on Earth today. (They are found in the wild, on reserves, and in some zoos.)

4. Explain to students that the animals are in danger of becoming extinct.

5. Ask students what they think is happening to these animals. (People are killing them for sport, destroying their homes to build other buildings, and polluting air and water.)

6. Ask students to tell how endangered animals can be helped. (If the cause of the endangerment is known, the animals can be helped.) Discuss why it is important to respect all forms of life and how protection of endangered animals relates to good citizenship.

7. Explain how students may become involved in an effort to help endangered animals.

8. Have students write letters to the following places for information on endangered animals:

   National Wildlife Federation
   1412 16th Street, N.W.
   Washington, D.C. 20036

   Alabama Wildlife Federation
   46 Commerce Street
   Montgomery, AL 36104

9. When information is received from federation sources, start a schoolwide, letter-writing campaign to save an endangered animal.

GRADE 2
LIFE SCIENCE

UNIT: Animals
TOPIC: Life Cycles
OUTCOME: 5. Explore life cycles of some animals.

Background

Living things undergo changes from birth to adulthood. Stages of growth comprise the life cycles of living things. Some changes are simple; others are drastic. The following activities encourage observation and exploration of animal life cycles.

Prepare LIFE CYCLE CARDS of the frog, butterfly, and beatle with correct number order written on back of cards as follows:

FROG: 1A, egg; 2A, tadpole; 3A, tadpole with legs; and 4A, frog

BUTTERFLY: 1B, egg; 2B, larva; 3B, pupa; and 4B, butterfly

BETTLE: 1C, egg; 2C, larva; 3C, pupa; and 4C, beetle

Color code the three sets of LIFE-CYCLE CARDS.

Materials

- Student baby pictures
- Baby animal pictures with matching adult pictures
- LIFE-CYCLE CARDS, cut apart with correct number order written on back (one set per two students)

Procedures

1. Have students share their baby pictures. Discuss the stages of growth that have occurred (hair, height, weight). Ask questions similar to the following:

   a. How do you think you will look as an adult? (Big, tall, hair)

   b. Do all animals change as they grow? (Yes)

2. Show pictures of baby animals that look very much like their parents.

3. Discuss changes that will occur as growth proceeds.

4. Have students match adult pictures with baby pictures.

5. Ask students which baby animals look very different from their parents.

OUTCOME 5 (Continued)
Procedures (Continued)

6. Explain to students that animals and people go through growth stages as they change from babies to adults. Explain that stages are parts of their life cycles.

7. Discuss the complete life cycle of a dog (puppy, young dog, adult dog).

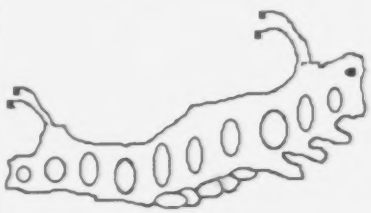
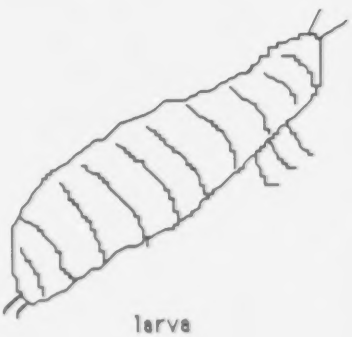
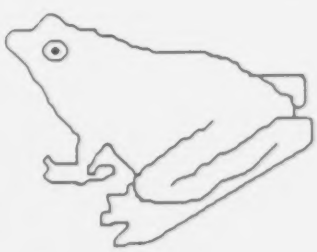
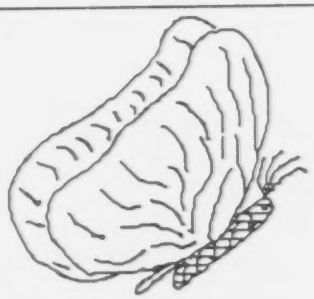
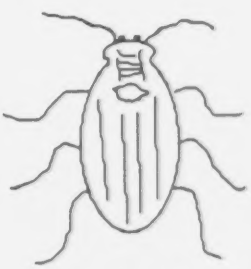
8. Pair students. Have each pair of students arrange the self-correcting, life-cycle cards in order.

9. Have students write stories about an animal's life cycle. Share the stories with the class.

OUTCOME 5 (Continued)

LIFE-CYCLE CARDS

Cut apart on the lines.

egg	egg	egg
tadpole	 larva	 larva
tadpole with front legs	pupa	pupa
 frog	 butterfly	 beetle

GRADE 2
LIFE SCIENCE

UNIT: Plants
TOPIC: Kinds of Plants
OUTCOME: 6. Describe a variety of plants, and compare them for similarities and differences.

Background

Plants can be found in many shapes, sizes, and colors almost everywhere on Earth. Plants support life on Earth. The green plant is a main source of energy and oxygen needed for sustaining life.

The following activity focuses on green plants.

Materials

- Juice or milk cartons
- Variety of green plant seeds (radish, corn)
- Soil
- Magazines with plant pictures
- Plant picture reference book
- Bulletin board
- Drawing paper
- Crayons

Procedures

1. Have students walk around the school yard and observe many different kinds of plants.

2. Have each student draw a picture of his or her favorite plant. Have students write two sentences about their favorite plants.

3. Schedule sharing time for students to show the pictures. Compare the plant pictures for similarities and differences.

4. Ask questions similar to the following:

    a. How are plants alike?
    (They need food, water, sunlight, and air.)

    b. How are plants different?
    (They differ according to size, shape, and number of leaves and flowers.)

5. Have students plant a variety of green plant seeds in juice or milk cartons. Observe the seeds daily for growth changes.

OUTCOME 6 (Continued)
Procedures (Continued)

6. Compare young plants for similarities and differences. (For each plant, notice the amounts of sunlight and water required, the color and number of leaves, and other similarities and differences.)

7. Have students draw the final growth stages of plants. Display the pictures on the bulletin board.

Extensions

Visit a greenhouse.

Have students cut a variety of plant pictures from magazines. Have plant picture books available for reference. Have students sort the pictures according to similarities in structure, size, flowers, no flowers, seeds, no seeds, and food plants.

Collect a variety of leaves from plants. Have each student place a piece of paper over a leaf. Instruct each student to use a crayon to rub over the leaf, making a print. Have students compare the leaf rubbings for similarities and differences.

GRADE 2
LIFE SCIENCE

UNIT: Plants
TOPIC: Adaptation of Plants to Their Environments
OUTCOME: 7. Observe and describe characteristics of plants that live in certain environments.

Background

Plants can be found all over the earth. Most plants are suited for the environments in which they live.

Materials

- Mounted pictures of desert, grassland, forest, and tundra environments
- Mounted pictures of plants that can be found in various environments
- Young geranium plant
- Young cactus plant
- Handout: PLANT GROWTH CHART

Procedures

1. Explain that plants grow all over the earth. Emphasize that most plants are suited for their environments.

2. Show pictures of desert, grassland, forest, and tundra environments one at the time.

3. For each picture, ask students a question similar to the following:

   What kind of plants can grow well in this environment?
   (Desert - plants that need little water and can survive extremely cold nights and hot days
   Grasslands - plants that need a lot of sunshine and rain
   Forests - plants that can grow with minimal sunlight)

4. Show the plant pictures. Have students select an environment for the plants as students consider the amounts of sunlight and water needed.

5. Have students compare the growth of a young cactus plant with a young geranium plant, both given the same conditions of water and sunlight over a three-week period.

6. Water the plants once a week. After each week, have students note the changes and differences on the handout PLANT GROWTH CHART. Ask students which plant needs more water and why. (The geranium needs more water. The cactus is suited for drier conditions.)

OUTCOME 7 (Continued)

PLANT GROWTH CHART
(Sample)

	Week 1	Week 2	Week 3
GERANIUM			
No. of leaves	7	5	3
Color	green	yellow/green	yellow
Height	___ inches	___ inches	___ inches
CACTUS			
No. of leaves	3	3	3
Color	green	green	green
Height	___ inches	___ inches	___ inches

OUTCOME 7 (Continued)

PLANT GROWTH CHART
Handout

	Week 1	Week 2	Week 3
GERANIUM No. of leaves Color Height			
CACTUS No. of leaves Color Height			

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Properties of Air
OUTCOME: 8. Describe characteristics of air.

Background

Air is a combination of several gases and is composed basically of oxygen and nitrogen. Air has certain properties or characteristics. Air is invisible and has no color, odor, or taste. Air has no shape of its own, takes up space, and has weight.

A thorough review of the following safety rules concerning plastic bags is advised:

a. Plastic bags should be distributed by the teacher.

b. Plastic bags should not be placed over the head.

c. Students should not chew plastic bags.

d. At the end of the activity, plastic bags should be collected from each student. The teacher should discard all plastic bags.

This activity requires two class periods of approximately thirty minutes each. The activity encourages problem solving and creative thinking.

Materials

- Two-arm or two-pan balance
- Balloons of uniform size (12)
- Balloons of different sizes (12)
- Plastic bags with twist ties (12)
- Fish bowl
- Paper towels
- Clear plastic cup
- Pitcher of water, 1 gallon
- Chalkboard

Procedures

Day One

1. Discuss the properties of air. As each property is discussed, write the property on the chalkboard.

OUTCOME 8 (Continued)
Procedures (Continued)

For this activity, focus on the following properities of air:

a. Air is invisible.
b. Air has no shape of its own.
c. Air takes up space.
d. Air has weight.

Erase all other properties of air from the chalkboard.

2. Divide the class into four groups of students. Assign a spokesperson for each group.

3. Place the materials for this activity on a table. Demonstrate the use of each item.

   a. Inflate a balloon.

   b. Blow air into a plastic bag.

   c. Demonstrate the use of the balance by using two deflated balloons.

   d. Place a paper towel into a cup.

   e. Pour water into the fish bowl.

4. Ask students to imagine how each item on the table can be used to demonstrate some of the properties of air.

5. Assign each group a different property. Ask each group to discuss its assigned property. Distribute the appropriate materials to the groups in the following manner:

Group 1/Property "a":	Clear plastic bags and twist ties
Group 2/Property "b":	Balloons of different sizes
Group 3/Property "c":	Fish bowl, plastic cup, paper towels, and water
Group 4/Property "d":	Balloons of uniform size and two-arm or two-pan balance

6. Review the properties of air listed in Procedure 1 with the students. Remind the students that they are looking for ways to prove their assigned properties to be true and that they are to use the materials given to their groups.

OUTCOME 8 (Continued)
Procedures (Continued)

7. Move from group to group as the students examine the materials. Make appropriate suggestions, and answer questions. Encourage each group to try different ideas, but remind students that each group will share its best idea with the class.

Possible Activities

Group One: Use the plastic bags to "catch" air, or blow air into the bags to show that it is invisible.

Group Two: Use the different-sized balloons to show that air can be blown into different sizes and different shapes, demonstrating that air has no shape of its own.

Group Three: Place the paper towel in the cup. Invert the cup, and push it into the bowl of water. (The paper towel will remain dry, demonstrating that air takes up space.)

Group Four: Weigh the deflated balloons; inflate one balloon, and reweigh it to prove that air has weight.

Day Two

1. Write the properties of air listed in Procedure 1, Day One, on the chalkboard as a review.

2. Direct each group to perform its activity for the class as the group reporter explains how the activity demonstrates the property.

3. Review each activity as the group finishes its presentation. Make comments and clarifications when necessary.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Location of Air
OUTCOME: 9. Discover the importance of air.

Background

Air is everywhere. The air around the earth is called atmosphere. Air is found in soil, water, and many other porous materials. Air, which contains oxygen, nitrogen, carbon dioxide, and other gases, is vital for plant and animal life on Earth. This activity will help students discover the importance of air and infer what life would be like on Earth without air.

Materials

- Pictures of the surface of the moon (May be ordered from NASA)
- Pictures of the earth from space (May be ordered from NASA)
- Pictures of different surface features of the earth
- Pictures of plants, animals, and people
- Drawing paper
- Crayons
- Chalkboard

Procedures

1. Discuss with students that air is found everywhere. State that air is found in soil and water. Explain that air is necessary for life to exist on Earth.

2. Show students pictures of the earth. Ask students what the various colors represent in the pictures.

3. Show students pictures of several living things that can be found on the earth.

4. Ask students to observe both sets of pictures and formulate ideas concerning how living things can exist on Earth. List students' ideas on the chalkboard.

5. Display pictures of the moon's surface. Explain that there is no atmosphere on the moon. Emphasize that in order to maintain life on the moon, astronauts must take a supply of air when they travel to the moon.

6. Instruct students to examine carefully the pictures of the moon and consider reasons why life does not exist on the moon. Write student inferences on the chalkboard.

OUTCOME 9 (Continued)
Procedures (Continued)

7. Emphasize that without air, the earth would be similar to the moon and living things could not exist.

8. Culminate the activity by reviewing the two lists on the chalkboard. Review the reasons students gave for life existing on Earth but not on the moon.

9. Give each student a sheet of drawing paper with a line drawn down the middle of the paper. Ask each student to draw a picture on the left side of the paper showing life on Earth. Ask each student to draw a picture on the right side of the paper depicting his or her perception of Earth with no atmosphere (air).

10. Display the students' pictures on a bulletin board. Discuss the pictures with the class.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Air Pressure
OUTCOME: 10. Observe and describe how air pushes in all directions.

Background

Air has weight. The earth is surrounded by air. Air pressure is created by air pressing upon the earth. Scientists have determined that air weighs fifteen pounds per square inch at sea level. Air applies equal pressure in all directions. The air pressure inside the human body pushing outward equals the air pressure outside the human body pushing inward. This is the reason the human body is not crushed by the weight of air. The following activity allows students to observe that air pushes in all directions. The teacher should demonstrate the activity while instructions are being given.

Materials

- Plastic gallon jugs of water (3 or 4)
- Large plastic buckets (3 or 4)

For each student:

- Clear plastic cup
- Cardboard or tagboard, cut into a square slightly larger than the mouth of the plastic cup

Procedures

1. Distribute plastic cups and cardboard squares to students.

2. Place plastic buckets and water jugs in various places in the classroom.

3. Explain to students that this activity will demonstrate that air pushes in all directions.

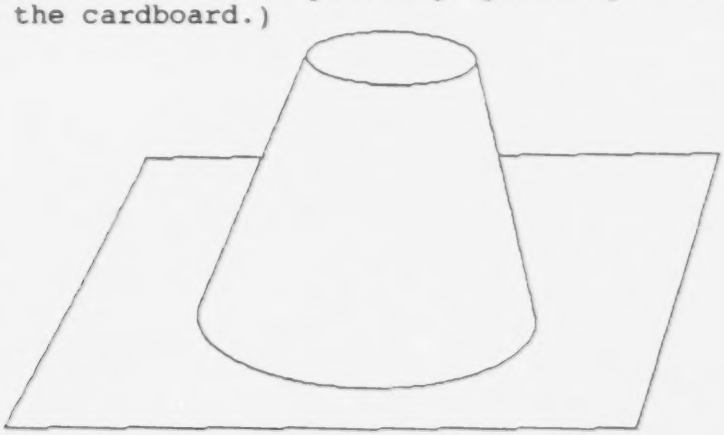
4. Ask each student to hold a cup over one of the large plastic buckets so that the buckets can catch any spills. Tell students to fill their cups to the top with water from the jugs of water.

5. Instruct each student to place the cardboard square over the top of the cup and hold the cardboard square firmly in place.

6. Tell each student to hold the base of the cup firmly with one hand while holding the cardboard square over the top of the cup with the other hand and quickly turn the cup upside down.

OUTCOME 10 (Continued)
Procedures (Continued)

7. Direct students to remove slowly their hands from the cardboard squares and to be very careful not to move the cardboard in any way. (The water and cardboard will stay in place because of the air pressing upward against the outside of the cardboard.)



8. Ask students to turn their cups sideways and then experiment carefully with other positions. (The water will stay in place because air exerts pressure in all directions.)

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Air Pressure
OUTCOME: 11. Discover how air can be compressed.

Background

The different gases in air are made up of rapidly moving molecules. When air is compressed, it is squeezed into a smaller and smaller space; therefore, the air pressure is increased due to the decrease in the size of the space that the air is allowed to occupy. Molecules, closer together in a smaller compressed space, collide with each other with a very rapid movement. When air is released into a less compressed area, the pressure decreases as the molecules are farther apart and, thus, have move space in which to move.

This activity requires one thirty-minute class session and can be completed outside on the playground if desired.

Materials

For each student:

- Balloons of uniform size (2)

Procedures

1. Give each student a balloon.

2. Instruct students to inflate partially their balloons and hold the ends of the balloons to prevent air from escaping.

3. Explain to students that they are forcing air into an enclosed space. Ask students to press on the sides of the balloon and to be physically aware (through the senses) of the air pressure on the inside of the balloon.

4. Instruct each student to inflate fully his or her balloon. Caution the students not to burst their balloons. Ask students to continue holding the ends of the balloons to prevent air from escaping.

5. Tell students to touch the outside of their balloons again. Ask students if the air pressure inside the balloon is greater now than when the balloon was partially expanded.

6. Explain that the air pressure is greater inside the balloon because more air has been compressed into a smaller space.

OUTCOME 11 (Continued)
Procedures (Continued)

7. Tell students to release their balloons quickly and observe what happens.

8. Discuss with students that air in a balloon is in a confined space. Explain that the air is compressed and under high pressure. State that when the air is released from the space, the air quickly moves from that space with a great deal of force to a space with less pressure outside the balloon.

9. Give each student another balloon.

10. Ask students to inflate partially their balloons and hold the ends closed to prevent air from escaping.

11. Instruct each student to press with a free hand the air in his or her balloon down to the bottom of the balloon.

12. Ask students what effect this action is having on the air in the balloons. (The air is being compressed or pushed into a smaller space, thus increasing air pressure.)

13. Tell students to release the hand used to press the air down inside the balloon. Ask students what happened to the compressed air. (The air pressure decreased as the compression decreased.)

14. Ask students to describe what happened to the air in the balloons in both activities. Assist the students in comparing the two activities and drawing conclusions as follows:

    a. When air is compressed into a smaller space and released, it will quickly move to an area of low pressure with a great deal of force.

    b. Air pressure decreases when the area of compression is enlarged.

    c. Air pressure increases when the area of compression becomes smaller.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Uses of Air
OUTCOME: 12. Identify the many uses of air.

Background

Air has many uses. Some uses of air include air travel, windmills, and machinery. Use of an airjack or tire pump forces air to be compressed into a small space and released with considerable force. Air can be used to make work easier. The following activity gives students an opportunity to observe how air can make work easier.

The activity requires one thirty-minute class session and enough space to ride a bicycle for several feet. The playground or a wide space in the classroom may be used. Safety precautions should be discussed with students prior to beginning this activity.

Materials

- Small bicycle
- Bicycle tire pump
- Chalkboard
- Drawing paper
- Crayons
- Bulletin board

Procedures

1. Ask students to examine the bicycle tires. Discuss with students the fact that air keeps tires inflated. Review the concept of air pressure. Remind students that air pushes in all directions and can be compressed.

2. Direct a student to deflate the tires on the bicycle.

3. Instruct a student to ride the bicycle a short distance. Discuss safety precautions. Ask the student to describe to the class the effort required to ride the bicycle. Afford several students the opportunity to ride the bicycle. Ask all students who ride the bicycle to describe the experience to the class.

4. Using the bicycle pump, ask several students to take turns pumping the bicycle tires back to normal size. Remind students about the characteristics of air pressure and how the air is being compressed into a small space.

OUTCOME 12 (Continued)
Procedures (Continued)

5. Have the previous bicycle riders ride the bicycle again. Ask the students to describe to the class the effort required to ride the bicycle. Have each bicycle rider compare the effort exerted on the two bicycle rides.

6. Lead a discussion concerning how air can make work easier. Solicit ideas from students. List student ideas on the chalkboard. Have students illustrate one of their ideas on paper. Display illustrations on the bulletin board.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Need for Air
OUTCOME: 13. Discover that living things need air to survive.

Background

Air contains oxygen, nitrogen, carbon dioxide, and small traces of other gases. The following activity will help students infer that living things need air to survive. The portion of the activity that involves using the candle, matches, and jar should be completed as a demonstration unless thorough safety precautions are observed and adequate adult supervision is provided. The activity requires one thirty-minute class session.

Materials

- Glass quart jar
- Small candle with a wide base
- Aluminum pie pan
- Kitchen matches

For each student:

- Small mirror

Procedures

1. Discuss with students the importance of air for all living things.

2. Give each student one small mirror. Instruct students to hold their mirrors under their noses and then breathe in and out through their noses.

3. Direct students, while still holding the mirrors under their noses, to look at their mirrors. Ask students to describe what is observed on their mirrors. (The mirrors will show condensation.) Discuss the findings by explaining that condensation on their mirrors shows the use of air to breathe. (As students inhale air, it is warmed by their bodies. When the warm air is exhaled, it is cooled and condensation forms on the mirrors.)

4. Ask students to hold the mirrors under their noses again. Have students hold their breaths for eight seconds (count the seconds for them) and remove the mirrors. Discuss the findings. (The mirrors will be clear.) Ask students to describe how they felt when holding their breaths. Help students draw the conclusions that the body needs air to live and that the mirror illustrates air being inhaled and exhaled.

OUTCOME 13 (Continued)
Procedures (Continued)

5. Ask students what would happen if there were no supply of air to breathe. Reinforce the fact that living things need air to live.

6. Tell students that the candle in the following demonstration represents living things that need air to live.

7. Direct students to observe the following demonstration:

    a. Place a candle on the aluminum pie pan.
    b. Light the candle.
    c. Place a quart jar over the candle.

8. Tell students that some of the oxygen in the jar will be consumed. Ask students to watch what happens to the flame on the candle. (The flame on the candle will be extinguished when the oxygen is consumed.)

9. Ask students to contemplate what happened to the candle when the oxygen in the air was consumed. Instruct students to resolve what would happen if the air around the earth were totally consumed. Encourage students to infer that life on Earth cannot exist without air just as the candle cannot burn without air (oxygen). Discuss inferences students may make about this demonstration.

    Note: If students participate in this activity, provide enough jars, candles, and pie pans for groups of two to four. Light all candles for the students.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Need for Air
OUTCOME: 14. Explain how living things obtain and use air: lungs, moist skin, gills, or spiracles.

Background

The respiratory system helps living things utilize air. The main function of the respiratory system in living organisms is to bring oxygen into the body and relieve the body of carbon dioxide. People use lungs to exchange oxygen and carbon dioxide. Fish use gills for respiration. Frogs, as amphibians, use both lungs and moist skin to help with respiration. A grasshopper breathes through spiracles found on either side of its abdomen and thorax.

Preparation for this activity includes obtaining animals for observation and animal housing containers. When using tap water for the fish and frog, prepare the water at least twenty-four hours in advance to ensure neutralization of chlorine. This activity can be completed in a forty-five-minute period.

Materials

- Live fish in transparent container
- Live frog in transparent container
- Transparent container with water
- Live insect in transparent container (Crickets or grasshoppers are easily obtainable.)
- Pictures of fish
- Pictures of insects
- Pictures of frogs
- Pictures of people

Procedures

1. Display the pictures in a prominent place in the classroom.

2. Explain to students that living things use air in different ways.

3. Ask students to observe each picture carefully. Explain to students that the animals in the pictures use air to obtain oxygen and that animals obtain oxygen from the air in different ways.

4. Have students study the pictures for a short period of time. Ask students to guess how each animal uses air to obtain oxygen.

OUTCOME 14 (Continued)
Procedures (Continued)

5. Discuss with students the manner in which each animal uses air:

   a. Humans (lungs)
   b. Frogs (lungs and skin)
   c. Grasshopper (spiracles)
   d. Fish (gills)

6. Have students observe the fish in its container. Ask students to observe the mouth and gill movements of the fish.

7. Have students observe the frog in its container. Ask students to observe the throat area and the moist skin of the frog.

8. Place the frog in a container of previously prepared water. Instruct students to continue observing the frog. Emphasize to students that the frog is no longer breathing with lungs. Emphasize that the frog is using skin to help obtain oxygen. Remove the frog from the water. Return the frog to the dry container.

9. Have students observe the grasshopper or cricket in its container.

10. Emphasize that the grasshopper or cricket obtains oxygen through spiracles located on either side of the abdomen and thorax.

11. Ask for a student volunteer to stand quietly in front of the class. Ask students to observe the nostrils and chest movements of the volunteer.

12. Have the student volunteer run in place for one minute.

13. Instruct students to observe the nostrils and chest movements of the volunteer.

14. Ask students to describe the breathing movements of the volunteer. Emphasize that the volunteer is using nostrils, mouth, and lungs (chest) to aid in breathing.

15. Explain to students that all four animals use air for the same purpose (to obtain oxygen) but that the mechanism for carrying oxygen into the body is different.

16. Instruct students to try to hold their breaths for twenty to thirty seconds (count seconds for the students).

17. At the end of twenty to thirty seconds, ask students to describe how they felt just before taking a breath.

18. Explain to students that their bodies require oxygen to live. Emphasize that without oxygen animals could not live. Tell students that what they felt before they took a breath was their bodies' way of saying more oxygen was needed.

19. Review with students the different methods animals use to obtain oxygen. Emphasize that animals use oxygen to maintain life.

20. Write a class experience chart about the activity. Use statements dictated by students. Edit the statements as a class activity. Display the chart.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Pollution of Air
OUTCOME: 15. Identify causes and control of air pollution.

Background

Air pollution is a major concern and is addressed in many science textbooks. Causes of air pollution range from major industrial waste to simple backyard burning of rubbish.

In this activity, students are encouraged to learn the causes of air pollution and investigate ways to ensure having clean air in the future. This activity takes one week to complete and involves two thirty-minute periods.

Materials

- Petroleum jelly (1 jar)
- Stapler
- Paper punch
- Chalkboard

For each student:

- Cardboard or heavy tagboard, 5" x 5"
- Wax paper, 4" x 4"
- Yarn, 12"
- Hand lens
- Sandwich bag
- Drawing paper
- Crayons

Procedures

Session One

1. Explain to students that air pollution is a threat to all living things because it refers to air that is unclean or dirty.

2. Ask students to imagine what it would be like to breathe dirty air all the time.

3. Allow students to discuss the problems of breathing dirty or unclean air. (Respiratory problems, sickness, disease)

4. Ask students if they think the air around them is clean or unclean.

OUTCOME 15 (Continued)
Procedures (Continued)

5. Tell students they will make an instrument to hang outside their homes for one week in order to check for possible pollution in the air in their neighborhoods.

6. Give each student one piece of cardboard, one piece of wax paper, and one piece of yarn.

7. Have students punch a hole at the top of the cardboard with the paper punch. Tell students to thread the yarn through the hole and tie a knot at the end of the yarn.

8. Instruct students to staple the wax paper to the cardboard at its four corners. Have students place the cardboard into a sandwich bag to carry home.

9. Instruct students to spread a thin layer of petroleum jelly over the wax paper.

10. Make an additional instrument to act as a control instrument.

    NOTE: The control instrument is to remain in the sandwich bag.

11. Have students take their pollution instruments home, remove them from the sandwich bags, and hang them outside for one week.

12. Hang the control instrument in a prominent place in the classroom. Explain to students that the control instrument will be compared to the instruments returned from the homes of students.

Session Two

1. At the end of one week, ask students to bring their pollution instruments to school and not to disturb or touch the wax paper.

2. Remove the pieces of wax paper from the pieces of cardboard.

3. Distribute a hand lens (magnifying glass) to each student.

4. Ask students to look closely at the wax paper through the hand lenses. Allow several minutes for observation.

5. Compare the wax paper from the classroom control instrument with several pieces of the students' wax paper.

OUTCOME 15 (Continued)
Procedures (Continued)

6. Emphasize to students that the control instrument is cleaner than the pollution instrument. Help students reach the appropriate conclusion that the debris on the students' instruments came from pollution in outside air.

7. Ask students to describe how debris settled on the wax paper. (Through the air) Ask students to name sources of debris that settled in the air. (Cars, factories, burning trash)

8. Encourage students to draw inferences about the different locations of the instruments and the varying amounts of debris on the instruments. (Heavy motor traffic in specific neighborhoods or factories may account for more pollution.)

9. Summarize student findings.

10. Review causes of air pollution.

11. Ask students to summarize ways air pollution can be controlled.

12. List on the chalkboard students' ideas regarding air pollution control.

13. Discuss each idea with the class. Encourage students to draw pictures of their ideas that may control pollution, and display these pictures on the bulletin board.

GRADE 2
EARTH SCIENCE

UNIT: Air
TOPIC: Pollution of Air
OUTCOME: 16. Communicate the need for control of air pollution.

Background

Air pollution is caused by many factors: industrial waste, motor vehicles, incineration, and many more. The effects of air pollution are serious and widespread, such as endangered plant and animal life, destruction of the ozone, destruction of buildings and statues, and reduction of food supplies. Education concerning the causes of air pollution and concerning the need for control of air pollution is vital to the future of today's students.

This activity requires one forty-five-minute class session.

Materials

- Pictures depicting examples of air pollution
- Pictures depicting examples of clear and clean air
- Books on air pollution
- Bulletin board
- Chalkboard

For each student:

- Drawing paper, 11" x 14"
- Crayons

Procedures

1. Display pictures of air pollution on a bulletin board or chalkboard. Have available books on air pollution.

2. Allow students fifteen to twenty minutes to examine the pictures and books.

3. Discuss with students the causes of air pollution, such as motor vehicles, industrial waste, and incineration.

4. Place pictures depicting clean air on a bulletin board or chalkboard.

5. Ask students to compare the pictures showing examples of clear air with the pictures showing examples of polluted air.

OUTCOME 16 (Continued)
Procedures (Continued)

6. Have students discuss the effects of polluted air shown in the pictures. List students' ideas on the chalkboard. (Dying trees, smog over cities, plant damage, people with respiratory problems, damage to buildings and statues)

7. Give each student an 11- by 14-inch sheet of drawing paper and crayons.

8. Ask students to divide the paper in half by drawing a line down the center.

9. Tell students to draw a picture on the left side of the paper showing a situation caused by polluted air and to draw a picture on the right side of the paper showing the same scene with clean air.

10. Give each student an opportunity to display and explain the pictures. Encourage students to explain the differences clean air makes in the second picture.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Surface of the Earth
OUTCOME: 17. Generalize that much of the earth's surface is covered by water.

Background

The earth's surface is about 75 percent water. This water is continuous in one large body of water. There are five bodies of water that make up this great continuous ocean: the Pacific Ocean, the Atlantic Ocean, the Indian Ocean, the Arctic Ocean, and the Antarctic Ocean.

This activity requires one forty-five-minute class session.

Materials

- Geographic globe, 12" in diameter
- Ball, 12" in diameter
- Blue clay, 1 pound
- Brown or green clay, 1 pound
- Black marker

Procedures

1. Have students observe a geographic globe.
2. Ask students to look carefully at the different colors on the globe.
3. Ask students which color represents the land masses and which color represents the oceans.
4. When students have differentiated between land masses and oceans, ask them to make an inference about which one takes up more space on the globe, land masses or oceans.
5. Divide the class into two groups.
6. Give one group one pound of brown or green clay and the second group one pound of blue clay.
7. Divide the clay into equal portions among the students of each group with each student having a small piece of clay.
8. Instruct students to make the clay pliable. Instruct students to flatten the clay and make all pieces approximately the same thickness.
9. With a black marker, outline the land masses on a ball the same size as the globe.

OUTCOME 17 (Continued)
Procedures (Continued)

10. Ask students with the brown or green clay to take turns placing the clay on the ball in the outline of the land masses.

11. When the land masses are covered completely, ask students to return any unused portions of clay.

12. Ask students with the blue clay to cover the remaining portion of the ball.

13. Instruct students to observe this process as they take turns in placing blue clay on the ball. (When the ocean group is finished, the ball will not be covered completely.)

14. Ask students to infer why more blue clay is needed. Remind students that both groups started with the same amount of clay. (Students should infer that since more blue clay is required, the ocean surface is much larger than the land mass surface.)

15. Remove the clay. Store the clay in a plastic bag for future use.

16. If the land mass group has brown or green clay remaining and the ocean group has no clay remaining, have students make inferences. If both groups have clay remaining, have students roll each piece of clay into a ball and weigh each ball to determine which group has more clay. Have students make inferences.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Characteristics and Properties of Water
OUTCOME: 18. Compare pond and distilled water.

Background

Untreated water from streams, ponds, and rivers may contain bacteria. Many of these bacteria are harmful if consumed. Bacteria must be destroyed before water can be used safely for drinking water. Distilled water has been taken through a purification process called distillation. Distilled water, because of purification, contains no living organisms. Pond water contains many living organisms that can be seen easily through a hand lens or microscope.

Prior to the activity, the pond water should be checked to ensure that students will be able to locate organisms. Label one container DISTILLED WATER and the other container POND WATER.

Materials

- Container of distilled water (1 pint)
- Container of pond water (1 pint)
- Medicine droppers (2)
- Chalkboard

- For each student:

- Hand lens
- Wax paper, 4" x 4" (2 sheets)
- Drawing paper, 9" x 12"

Procedures

1. Display the two labeled containers of water for the class to observe.

2. Ask students to observe the two containers and look for differences in the water.

3. Discuss the students' observations. List the observations on the chalkboard. (Color, clearness, amount of debris in the water)

4. Tell students that the distilled water has been purified and contains no living organisms and that the pond water has not been purified and contains many living organisms.

5. Distribute a hand lens, two pieces of wax paper, and drawing paper to each student.

OUTCOME 18 (Continued)
Procedures (Continued)

6. Direct students to draw a line down the center of the drawing paper and label the left side POND WATER and the right side DISTILLED WATER.

7. Have each student place one piece of wax paper over the right side of the drawing paper and one piece of wax paper over the left side of the drawing paper.

8. Using a clean medicine dropper, place four to five drops of pond water on each student's wax paper under the heading POND WATER. Instruct students to observe the drops with hand lenses.

9. Using a clean medicine dropper, place four to five drops of distilled water on each student's wax paper under the heading DISTILLED WATER. Instruct students to observe the water with hand lenses.

10. Ask students to slide very carefully both pieces of wax paper above the drawing paper and use the drawing paper to draw what they saw in each sample of water-

11. Display pictures, and discuss student observations. (The distilled water will be clear, while the pond water will contain debris.)

12. Reinforce the concept that the distilled water is purified and is safe to drink, while the pond water contains many organisms and is unsafe to drink.

Extension

Have students observe distilled water and pond water through a bioscope or microscope and make additional observations.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Characteristics and Properties of Water
OUTCOME: 19. Demonstrate that water takes up space and has weight.

Background

Water is a liquid. Water has weight and takes up space. The following activity requires one forty-five-minute class session.

Materials

- Two-pan balances (5)
- Plastic jugs, 1 gallon (2)
- Plastic jugs of water, 1 gallon (2)
- Buckets of sand, 1 gallon (2)
- Plastic scoops for each sand bucket (2)
- Plastic sheeting

For each student:

- Self-sealing plastic bags (2)

Procedures

1. Explain to students that water is a liquid and has its own characteristics and properties. Two properties include the following:

   a. Water has weight.
   b. Water takes up space.

2. Show students an empty one-gallon plastic jug. Place the jug on one side of a two-pan balance.

3. Show students another empty one-gallon jug. Place the jug on the other side of the two-pan balance.

4. Demonstrate that the empty jugs balance one another.

5. Remove one of the jugs, and fill it with sand.

6. Return the filled jug to the balance.

7. Demonstrate that the jug full of sand is now heavier than the empty jug.

8. Explain to students that the sand is now taking up space in the jug and that sand has weight and is heavier than the empty jug as demonstrated by the two-pan balance.

OUTCOME 19 (Continued)
Procedures (Continued)

9. Empty the sand from the plastic jug.

10. Fill the jug with water. Explain to students that just as the sand took up space in the jug, water is now taking up space.

11. Return the filled jug to the balance.

12. Explain to students that the water is now taking up space in the jug and that water has weight and is heavier than the empty jug as demonstrated by the two-pan balance.

13. Place the sand in the center of a piece of plastic sheeting. Distribute the two-pan balances in different locations in the classroom.

14. Give each student two self-sealing plastic bags.

15. Direct each student to place the bags on opposite sides of a two-pan balance to demonstrate that the bags are equal in weight.

16. Ask each student to fill one of the bags with sand until it is about one-half full and then "lock" the bag.

17. Direct each student to place the filled bag on one side of a two-pan balance and the empty bag on the other side of a two-pan balance. Ask each student to observe the difference in weight.

18. Ask students to empty the sand from their bags into the sand bucket.

19. Direct each student to pour water into one of the bags until it is one-half full and then "lock" the bag.

20. Tell each student to place the bag of water on one side of a two-pan balance and the empty bag on the other side of a two-pan balance.

21. Instruct students to observe the difference in weight between the two bags.

22. Ask students to discuss how this activity helps show that water has weight and takes up space. Help students draw the following conclusions:

    As the sand took up space, so did the water. The water occupied the same space that the sand occupied. The experiment with the two-pan balance was proof that the sand had weight and that the water had weight.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Characteristics and Properties of Water
OUTCOME: 20. Show that water can exist in any one of three states.

Background

Water can be changed from a liquid into a solid in the form of ice. Water can also be changed into a gas in the form of water vapor. When water is in the gaseous state, the water molecules are so far apart that the water cannot be seen.

Review the following **SAFETY PRECAUTIONS** with the students before undertaking the activity:

a. Never reach across a flame.

b. When using a flame, keep long hair tied back away from the face.

c. Aways point open end of test tubes away from other students and self.

d. Blow the candle out immediately after the activity is completed.

e. Never leave a flame unattended.

This activity should be used only as a demonstration.

Materials

- Crushed ice, 1 teaspoon
- Match
- Ice cube in a glass container
- Glass container of water
- Aluminum pie pan
- Candle with large base
- Test tube
- Test-tube holder (wooden clothespin)

Procedures

1. Explain to students that water can exist in three states: solid, liquid, and gas.

2. Show students a glass container of water and an ice cube in a glass container.

3. Ask students to identify which container holds the liquid state of water and which container holds the solid state of water.

4. Review safety rules. When necessary, demonstrate them.

5. Instruct students to observe the following experiment carefully in order to identify water in its three states.

   a. Anchor the candle in the aluminum pan. Show students the test tube and test-tube holder.

   b. Place crushed ice into the test tube.

   c. Light the candle. Hold the test tube by the test-tube holder slightly over the flame, not in the flame. (If the test tube is held in the flame, carbon will accumulate on the test tube and will obstruct the view.)

   d. Remind students that the demonstration begins with water in a solid state. Instruct students to observe carefully when the water changes to liquid and gaseous states.

   e. Ensure that students observe the following changes:

      (1) Ice melting
      (2) Water droplets forming on inside of test tube
      (3) Water boiling
      (4) Water vapor rising from mouth of test tube

6. Extinguish the candle, and carefully place the test tube in the pie pan. Warn students not to touch the test tube.

7. Have students discuss their observations and emphasize the points at which the three states of water were visible. (Solid state: crushed ice; liquid state: melted ice or water from crushed ice; gaseous state: space between the mouth of the test tube and the water vapor)

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Characteristics and Properties of Water
OUTCOME: 21. Demonstrate and observe that moving water has force and can do work.

Background

Moving water can exert force. The force of moving water is called kinetic energy. The faster water moves, the more force it generates. Moving water can be used to do work by utilizing the kinetic energy to move machines, such as water wheels or turbines. This activity will help students understand that moving water has force and can do work.

One thirty-minute class session is needed to complete this activity. Duplicate the handout WATER WHEEL on construction paper. Access to running water (faucet and sink or plastic jug, water, and bucket) is required for this activity.

Materials

- Pictures of water falls, dams, floods
- Faucet and sink or plastic jug, water, and bucket
- Chalkboard

For each student:

- Handout: WATER WHEEL
- Crayons
- Scissors
- Pencil

Procedures

1. Explain to students that moving water produces considerable force.

2. Show students pictures of waterfalls, dams, and floods. Ask students for other examples of moving water. Write students' responses on the chalkboard.

3. Tell students that they will make a wheel that will turn from the force of moving water.

4. Distribute the handout WATER WHEEL, scissors, and crayons to each student.

5. Ask students to color a thick layer of crayon over the wheel on both sides. Explain that the crayon stiffens the paper and aids in waterproofing the surface.

OUTCOME 21 (Continued)
Procedures (Continued)

6. Instruct students to cut along dotted lines and fold on the solid lines so that the fold is at a right angle or sticking out away from the center of the wheel.

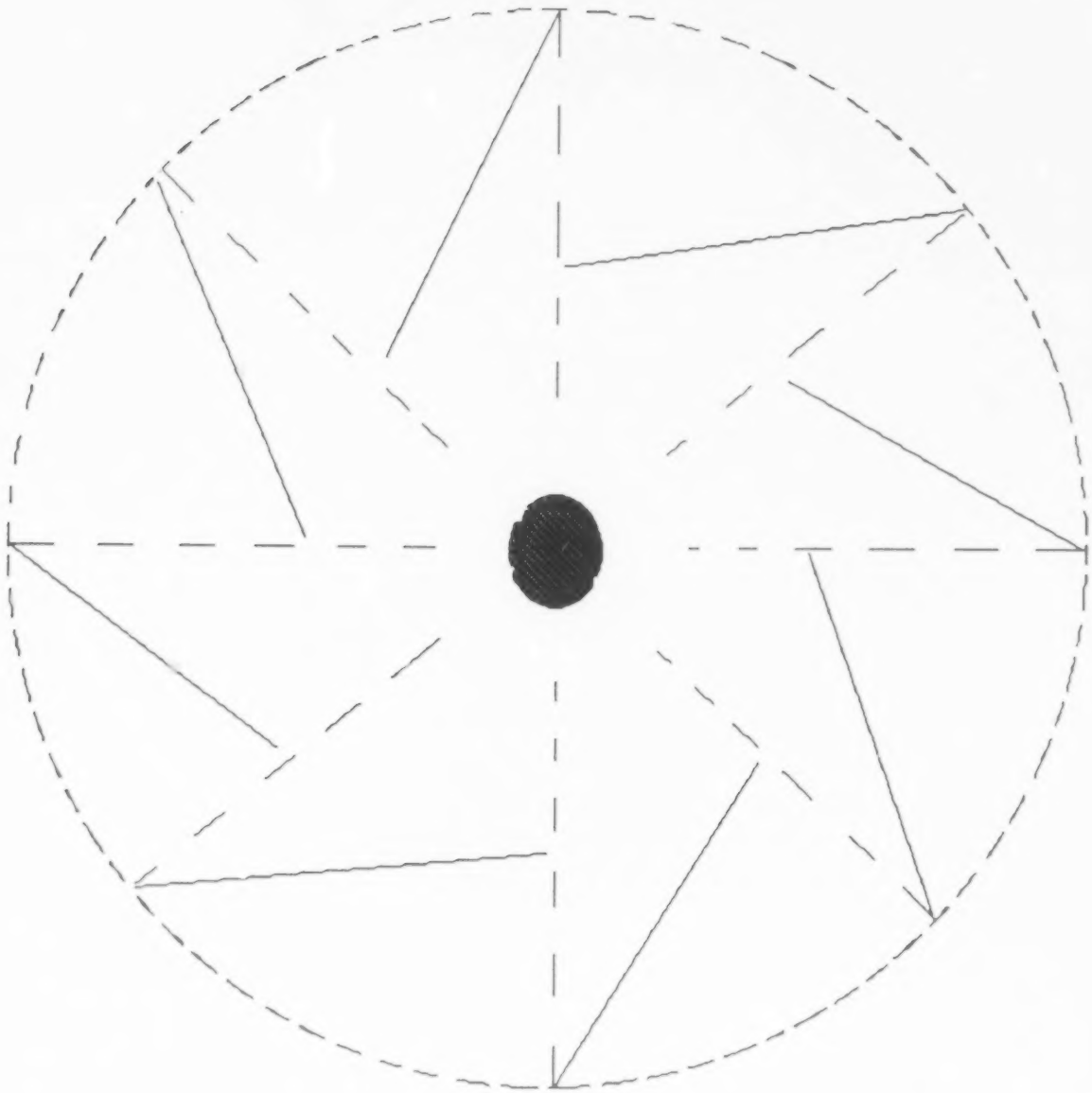
7. Tell each student to push a pencil through the center of the wheel and widen the hole to ensure a free spin of the wheel.

8. Instruct students to hold their wheels under running water and observe what happens. (If a faucet is not available in the classroom, a plastic jug filled with water may be poured over the wheels to make them turn. A bucket positioned under the wheels may catch the spills.)

9. Ask students to lessen the flow of water and strengthen the flow of water. Have students explain what happens. (The more force the water exerts, the faster the wheel turns.)

10. Reinforce the concept that moving water exerts force.

WATER WHEEL
Handout



Cut on the dotted lines.
Fold on the solid lines.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Uses of Water
OUTCOME: 22. Record the uses of water for recreational activities.

Background

Water is used for many recreational activities. Many students take part in one or more recreational activities involving the use of water. In this activity, students identify many recreational uses of water and discover the activities that are most popular with students in their classroom.

Preparation for this activity includes accumulating magazines that contain pictures of water sports and activities. This activity requires one forty-five-minute class session or may be divided into two twenty-five-minute class sessions.

Materials

- White poster board (2)
- Markers (4 different colors)
- Chalkboard

For each student:

- Magazine
- Scissors
- Glue

Procedures

1. Ask students to think about their favorite recreational activity involving water.

2. List students' responses on the chalkboard.

3. Show students the large piece of poster board. Explain to students that the class will cover the poster board with pictures showing recreational uses of water.

4. Distribute magazines, scissors, and glue to students. Instruct students to cut pictures from magazines that show recreational uses of water.

5. Tell students to cover the piece of poster board with magazine pictures showing recreational uses of water.

6. Display the covered poster board. Let students identify the activities in the pictures.

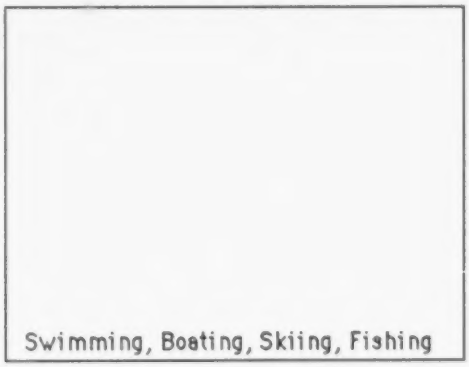
7. Ask students to observe the pictures of recreational activities previously listed on the chalkboard.

8. Instruct students to vote for their favorite activity.

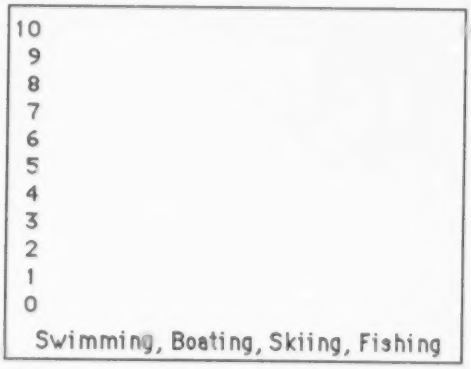
9. List the four most popular activities on the chalkboard.

10. Show students the second piece of white poster board.

11. Write the four favorite water activities horizontally across the bottom of the second poster board.

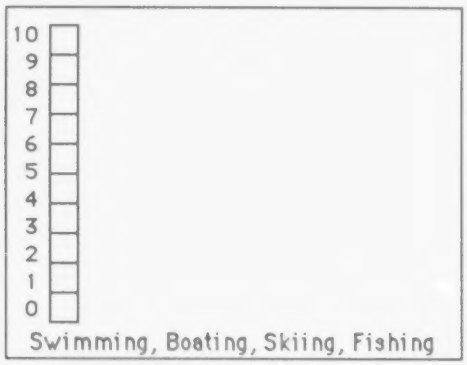


12. Number vertically from the bottom of the second poster board to the top of the poster board. Begin with zero, and end with the number that represents the highest vote count for an activity. (If swimming received the most votes with ten votes, number from zero to ten.)



OUTCOME 22 (Continued
Procedures (Continued)

13. Construct a bar of squares for each activity with one square representing each vote tallied for that activity. Keep the squares a uniform size.



14. Ask each student to color a square above the activity that received his or her vote. (Four different colors of markers should be used to represent the four different water activities.)

15. Tape the collage of water activities to the graph of favorite water activities.

16. Ask students to observe carefully the finished collage and bar graph.

17. Using the collage, review the many uses of water for recreational activities.

18. Using the bar graph, review the favorite water activities of students in the class.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Importance of Water
OUTCOME: 23. Observe, describe, and explain the importance of the water cycle to living things.

Background

The water cycle is a continuous cycle of evaporation, condensation, and precipitation. Surface water from all bodies of water on the earth evaporates in the form of water vapor. Oceans account for the majority of evaporation on the earth's surface, but evaporation does occur from soil and green plants. Water vapor condenses and falls back to Earth in the form of rain, snow, or sleet. This precipitation flows into streams, lakes, and rivers to the ocean to form a continuous cycle called the water cycle.

This activity aids the students in visualizing the water cycle and its importance to living things. The activity requires two thirty-minute class sessions.

Materials

- Hot plate
- Tray of ice cubes
- Heat-proof glass container with handle
- Flat pan with handle
- White bulletin board paper, 6'
- Crayons or paints
- Plastic container of water, 1 gallon
- Globe or world map
- Chalkboard or bulletin board

Procedures

Day One

1. Explain the water cycle to students. Use visual aids, such as a geographic globe or world map, to illustrate the large body of water that covers the majority of the earth's surface.

2. Tell students to observe carefully the following activity that demonstrates the water cycle:

   a. Fill the heat-proof glass container with water from the plastic gallon container. Place the glass container on the hot plate. (Keep students inaccessible to the hot plate, plug, and glass container.)

   b. Turn on the hot plate. Boil the water.

OUTCOME 23 (Continued)
Procedures (Continued)

c. Place the ice cubes on the flat pan. Hold the pan about ten inches above the surface of the boiling water.

d. Ask students to observe and describe what happens. Possible responses are:

(1) The water is boiling.

(2) Steam or water vapor is rising.

(3) Water vapor is touching the bottom of the flat pan of ice.

(4) Water vapor is condensing on the bottom of the flat pan of ice. Water droplets are forming.

(5) Water droplets from the cold bottom of the flat pan of ice are falling into the pot of boiling water.

e. Explain that water evaporates from the earth in the form of water vapor in the same way water vapor is rising from the pan of hot water. Emphasize that water vapor condenses in the colder atmosphere above the earth in the same way the water vapor is condensing on the bottom of the cold, flat pan. Explain that the condensed water vapor in the atmosphere falls to earth in the form of rain or another form of precipitation just as the water droplets are falling from the bottom of the cold, flat pan into the boiling water.

f. Culminate this activity by dividing the class into four groups.

g. Tape the six-foot length of white bulletin board paper to the chalkboard or bulletin board.

h. Tell each group that it is responsible for drawing one part of the water cycle. Assign each group a different part of the water cycle to illustrate, similar to the following:

Group 1. Land with lakes and rivers running into the ocean

Group 2. Water evaporating from the ocean surface

OUTCOME 23 (Continued)
Procedures (Continued)

Group 3. Water condensing in the atmosphere to form clouds

Group 4. Water droplets returning to the earth's surface in the form of rain or snow

Day Two

1. Provide planning and work time for each group to add its particular part to the water-cycle mural. Give assistance and advice only when necessary.

2. Display and title the mural "The Water Cycle."

3. Tell students to observe their water-cycle mural.

4. Ask students what would happen if one of the parts were missing from the picture. (If Group 2 were removed, there would be no evaporation process, and no rain would fall.)

5. Discuss with students the importance of all parts of the water cycle. Emphasize the results if the water cycle were disturbed. (No rain would fall on crops, plants, or any other living thing.)

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Importance of Water
OUTCOME: 24. Discover that all living things need water to survive.

Background

Living things are dependent upon water to survive. Plants and animals use water in different amounts and in different ways. Some animals that do not actually consume water derive water from the foods they eat. Many plants and animals can store water for long periods of time. Some plants and animals must have a constant supply of water to survive. All living things, in the web of life, are dependent upon water to survive.

This activity requires two thirty-minute class sessions with an interval of five days between each session.

Materials

- Pictures of desert regions
- Pictures of green woodlands or croplands
- Plants, same size and variety (2)
- Chalkboard

For each student:

- Crayons
- Drawing paper

Procedures

Session One

1. Explain to students that all living things need water to survive.

2. Ask students to imagine the quality of their lives without water.

3. List student responses on the chalkboard. (A lack of water to drink; no water for cooking, cleaning, washing, or bathing; no water for crops or trees; no water for lawns and shrubs)

4. Show students pictures of dry, arid desert regions.

5. Ask students to examine the pictures and describe them.

6. Show students pictures of fertile croplands, woodlands, or any picture showing a lush abundance of green plants and living things.

OUTCOME 24 (Continued)
Procedures (Continued)

7. Ask students to examine and describe the pictures.

8. Instruct students to compare the two types of pictures and describe the differences.

9. Ask students to observe the list on the chalkboard and find the differences that exist because of lack of water or abundance of water.

Lack of Water	Abundance of Water
Dry soil	Fertile soil
Few plants	Green plants
Plants adapted to desert region	

10. Distribute a sheet of paper to each student. Instruct students to write the following:

Date	Plant With Water Observations	Plant Without Water Observations

11. Tell students they will observe two plants for five days. Explain that one plant will not receive water; the second plant will receive water regularly.

12. Place the two plants in an easily accessible location in the classroom.

13. Instruct the students to record the date and their observations daily for five days on the paper provided.

OUTCOME 24 (Continued)
Procedures (Continued)

Session Two

1. At the end of the five-day observation period, ask students to read several of their observations for both plants.

2. Ask students to compare the appearance of both plants and make an inference about why they look different. (The plant that received water is green and healthy-looking. The plant that did not receive water is not healthy-looking and will die.)

3. Review with the students that all living things require water to survive.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Pollution of Water
OUTCOME: 25. Discover that polluted water contains impurities that damage living and nonliving things.

Background

Polluted water affects living and nonliving things. The impurities in polluted water can be highly visible in litter and waste materials or can be microscopic in certain chemicals and gases. These impurities attack and kill plants and animals living in and around polluted water. Nonliving objects, such as ships, docks, and buildings, are damaged because of the impurities in polluted water.

This activity requires thirty minutes. Containers of polluted and nonpolluted water should be collected. If a source of polluted water is not available, polluted water can be made by mixing apple and orange peels or detergent in tap water.

Materials

- Labeled container of polluted water
- Labeled container of nonpolluted water
- Pictures depicting water pollution
- Chalkboard

For each student:

- Wax paper, 8 1/2" x 11" (2)
- Hand lens

Procedures

1. Ask students to describe water pollution.

2. Display a labeled container of nonpolluted water and a labeled container of polluted water.

3. Ask students to compare the nonpolluted water with the polluted water.

4. To each student, distribute two sheets of wax paper, a hand lens, and a small sample of nonpolluted and polluted water, one on each sheet of wax paper.

5. Have students observe each sample through the hand lens.

OUTCOME 25 (Continued)
Procedures (Continued)

6. List student observations on the chalkboard under the headings Polluted Water and Nonpolluted Water. List observations similar to the following:

Polluted Water	Nonpolluted Water
1. Floating debris	1. No debris
2. Not clear	2. Clear
3. Dirty-looking	3. Clean-looking

7. Ask students to make a prediction as to which of the water samples would be suitable for living things to exist and grow.

8. Discuss with students the listed impurities that could harm or destroy living and nonliving things.

9. Display pictures of water areas that have been polluted by different sources (factory waste, dumping, litter, sewage).

10. Instruct students to examine carefully the pictures of water pollution.

11. Ask students to describe the impact polluted water has on living and nonliving things in each picture.

12. Explain to students that the impurities found in the water and the impact of water pollution affect living and nonliving things found many miles from the actual source of pollution.

GRADE 2
EARTH SCIENCE

UNIT: Water and Oceanography
TOPIC: Pollution of Water
OUTCOME: 26. Explore causes of water pollution, and draw conclusions about preventive methods.

Background

Water pollution is currently a serious problem threatening the world. As the population of the world expands, more water will be required to fill the growing need for clean water. If pollution is not curtailed, there will be a sharp decrease in the amount of safe, consumable drinking water. Preventive measures should be taken immediately to ensure adequate, safe drinking water.

Materials

- Pictures depicting five or more causes of water pollution
- Chalkboard

For each group:

- Poster board

For each student:

- Crayons or colored pencils

Procedures

1. Have students observe pictures of polluted water.

2. Ask students to observe each picture and identify the cause(s) of water pollution.

3. List on the chalkboard causes of water pollution (sewage, factory waste, dumping, litter).

4. Divide the class into small groups. Using the causes of water pollution listed on the chalkboard, assign each group a different cause, similar to the following:

   Group 1. Sewage
   Group 2. Factory Waste
   Group 3. Dumping
   Group 4. Litter
   Group 5. Pesticides

5. Tell each group to use problem-solving techniques to solve its particular water-pollution problem.

OUTCOME 26 (Continued)
Procedures (Continued)

6. Instruct students to follow the problem-solving model below:

   a. Identify the problem.
   b. Find possible solutions.
   c. Investigate each possible solution.
   d. Arrive at the best solution.

7. Allow each group time to discuss the problem and formulate a possible solution.

8. Distribute poster board to each group.

9. Have each group illustrate on poster board how its particular water pollution problem was solved.

10. Have each group select one student to act as the group reporter.

11. Instruct each reporter to explain the group's problem and solution to the problem. Display the illustrations.

12. Ask other groups to comment on the solution of the reporting group and to give other ideas that might solve the pollution problem.

13. Display posters for other classes to view.

14. Ask other classes for possible solutions to water pollution problems. (An idea envelope may be added to the posters on display.)

GRADE 2
EARTH SCIENCE

UNIT: Weather
TOPIC: Weather Conditions
OUTCOME: 27. Observe and record that weather conditions change daily.

Background

Weather is the active or inactive state of the atmosphere at any given time. Meteorologists are people who study weather and make weather forecasts. Weather conditions change on a daily basis. Observations of daily weather conditions help meteorologists forecast the weather with more accuracy.

This activity requires one week to complete. Two observation periods per day of approximately fifteen minutes each should be scheduled. The first and last class sessions require thirty minutes each.

Materials

- Weather thermometer
- Chalkboard

For each student:

- Drawing paper, 11" x 14"
- Ruler 12"

Procedures

Part A

1. Explain to students that they will be observing the weather twice daily for one week. State that observations will occur during the morning and the afternoon.

2. Have students state weather conditions that might be observed.

3. List student responses on the chalkboard. (Clear or cloudy skies, sunny, rainy)

OUTCOME 27 (Continued)
Procedures (Continued)

4. Copy the following chart on the chalkboard:

	Morning Observation		Afternoon Observation	
Day	Tempera-ture	Conditions	Tempera-ture	Conditions
1				
2				
3				
4				
5				

5. Distribute a sheet of drawing paper to each student. Ask students to make weather charts like the one on the chalkboard.

6. Instruct students to complete their charts during each morning and afternoon observation time.

7. Place a thermometer outside the school building for the students to observe.

8. Explain to students that, in order to complete the chart, they are to use such terms as windy, cold, clear, rainy, hot, and sunny to describe the weather conditions. Instruct students to read the thermometer located outside the building and record the temperature accurately.

9. Record morning observations and afternoon observations at the same time each day.

Part B

1. At the end of the five-day observation period, ask students to observe their charts carefully.

2. Instruct students to compare the daily temperature for the morning and for the afternoon observation times.

3. Ask students to describe what differences, if any, can be observed. (Usually afternoon temperatures will be higher than morning temperatures.)

OUTCOME 27 (Continued)
Procedures (Continued)

4. Tell students to read their daily weather conditions for the morning and the afternoon observation periods.

5. Ask students to share morning and afternoon weather changes recorded on their charts during the same day. (Monday morning: cloudy and cold; Monday afternoon: sunny and warm)

6. Instruct students to compare the weather that occurred each day of the five-day observation period.

7. Ask students to share changes that took place. Have students record changes on the chalkboard.

8. Have students examine all data carefully. Ask students to make an inference concerning the importance of recording daily weather conditions. (Weather changes on a daily basis. It is important to many people who work outside to know about the changes in weather.)

GRADE 2
EARTH SCIENCE

UNIT: Weather
TOPIC: Use of Instruments
OUTCOME: 28. Use weather instruments to measure weather conditions.

Background

Weather instruments are used by meteorologists to measure and record changes in weather conditions. Weather instruments are used to measure temperature, humidity, air pressure, wind speed, wind direction, and precipitation. With information from weather instruments and observation of daily weather conditions, meteorologists can accurately forecast the weather.

Materials

For each student:

- Alcohol weather thermometer

Procedures

1. Distribute thermometers to each student.
2. Instruct students to examine the thermometers carefully.
3. Ask students to share their observations with the class.
4. Explain to students that the thermometer is an instrument used to measure the temperature of the air. Explain to students that the alcohol in the glass tube of the thermometer expands and rises when the air is warm and contracts and falls when the air is cool.
5. Tell students to observe carefully the markings and numbers on the side of the thermometer. Explain that the markings are increments and are read in either degrees Fahrenheit or Celcius. (Determine which the students are to use.)
6. Explain to students that when the alcohol is stable (stops moving), the temperature of the air is measured by the number that corresponds to the position of the alcohol.
7. Ask students to observe the thermometer and determine the temperature of the air.
8. Write the temperature on the chalkboard.
9. Instruct students to fan their thermometers with a piece of paper for one minute and observe the alcohol in the thermometers. (Temperatures will be lower.)

OUTCOME 28 (Continued)
Procedures (Continued)

10. Discuss with students any differences in the two temperatures.

11. Repeat the activity with students until they can read and record temperatures accurately.

12. Have students take their thermometers outside the school building.

13. Ask students to observe their thermometers and measure the temperature of the air outside the school building.

14. Ask students to compare the temperature inside the building with the temperature outside the building.

15. Ask students which number represents the warmer temperature and which number represents the cooler temperature.

16. Give students many opportunities to read and record temperatures with their thermometers at various locations on the school grounds.

GRADE 2
EARTH SCIENCE

UNIT: Weather
TOPIC: Use of Instruments
OUTCOMES: 28. Use weather instruments to measure weather conditions.

29. Record and interpret data about weather over a period of several days.

Background

Weather changes on a daily basis. Careful observation and record keeping help meteorologists and the general public make decisions relating to weather. Proper interpretation of data concerning weather is important in forecasting weather conditions.

A thermometer is an instrument used to measure temperature (the degree of hotness and coldness). A thermometer consists of a graduated glass tube with a sealed bore in which mercury or colored alcohol rises or falls as it expands or contracts from changes in temperature. CAUTION: Due to the hazards of mercury, it is recommended that only alcohol thermometers be used.

Aneroid barometers are used to measure air pressure. An aneroid barometer uses a sensitive hollow disc that responds to changes in air pressure. Falling air pressure means low pressure and bad weather. Rising air pressure means high pressure and good weather.

A wind vane points in the direction from which the wind is blowing. An anemometer is an instrument that measures wind force and speed. Both instruments are important in helping the meteorologist observe and predict weather.

This activity requires five days to complete. Fifteen minutes each day for observing and recording data are needed. Class time on Day One and Day Five requires forty-five minutes each. Knowledge of the following weather instruments is needed: thermometer, aneroid barometer, wind vane, and anemometer.

Materials

- Large alcohol thermometer
- Aneroid barometer
- Wind vane
- Anemometer
- Chalkboard

For each student:

- Drawing paper, 11" x 14"

OUTCOMES 28 and 29 (Continued)

Procedures

Days One Through Four

1. Discuss with students the importance of making careful observations and keeping accurate data about weather.

2. Tell students that they will observe and record weather patterns for five days.

3. Distribute one sheet of paper to each student.

4. Copy the following chart on the chalkboard.

W E A T H E R W A T C H					
Day	Temperature	Barometric Pressure	Wind Direction	Wind Speed	Weather Conditions

5. Ask each student to use drawing paper to make a weather chart like the one on the chalkboard.

6. Explain to students that they are to observe and record weather data for a period of five days.

7. Display a thermometer, aneroid barometer, wind vane, and anemometer for the class to observe.

8. Use the following information to explain how each instrument works and the importance of each instrument in observing and predicting weather.

   a. A thermometer measures the temperature of the air. Demonstrate how the temperature is read on the scale of the instrument.

Procedures (Continued)

b. An aneroid barometer has a disc inside that expands with high air pressure and contracts with low air pressure. Air pressure can be read in inches or millimeters. High air pressure usually means good weather. Low air pressure usually means bad weather.

c. A wind vane is shaped like an arrow. The wind strikes the larger end of the arrow shape and turns the pointed end toward the direction from which the wind is blowing.

d. The anemometer has four cups (one of which is red) attached to a wheel set horizontally on an axle. As the wind blows, the cups turn. The harder the wind blows, the faster the cups turn. The number of turns is calculated by observing the red painted cup.

9. Allow adequate time for students to examine and use each instrument.

10. Have students decide upon a specific time of day to gather weather data for the five-day period.

11. Take students outside at the same time each day to gather and record data on their charts.

12. Have students look at the thermometer at the same time each day and measure the temperature of the air. Have students record the temperature on their charts.

13. Allow observation time each day for students to look carefully at the barometer. Record the barometric reading and existing weather conditions at the same time each day. (Sunny and cold, sunny and warm, cloudy and cold)

14. While students are outside, demonstrate how to determine wind direction by using the wind vane. To ensure accurate data, stand in the same position each day to review directions (north, south, east, and west) with the class.

15. Demonstrate for students how the anemometer is used to arrive at wind speed by counting the number of times the red cup revolves. A quick method of calculating wind speed is to count the number of revolutions in one minute and divide that number by ten. Have the class observe the calculation of the wind speed.

16. Repeat this procedure each day for five days.

Procedures (Continued)

17. Give students assistance in using the weather instruments. Discuss the weather data obtained each day. Help students verbalize their observations. Record data on the class chart on the chalkboard as students record data on their individual weather charts.

Day Five

1. At the end of the last observation and recording period, ask students to observe the collected data on the chalkboard.

2. Direct students to check their data charts for the following:

   a. The warmest recorded temperature
   b. The coolest recorded temperature
   c. The highest wind speed
   d. The most constant wind direction
   e. The lowest barometric reading
   f. The highest barometric reading
   g. The most frequently occurring weather conditions

3. Ask students to become familiar with the data and respond to the following:

   a. What kind of air pressure has occurred in the past five days?

   b. What kind of weather has occurred in the past five days?

   c. Match the highs and lows to the kind of weather that occurred each day. (High air pressure brings fair weather; low air pressure brings bad weather.)

   d. What kind of weather occurs on high pressure days? (Good)

   e. What kind of weather occurs on low pressure days? (Bad)

4. Review the uses of the aneroid barometer as it relates to high pressure and low pressure. Emphasize that meteorologists rely on such instruments to predict the weather accurately.

OUTCOMES 28 and 29 (Continued)
Procedures (Continued)

5. Ask students to formulate ideas concerning how weather conditions might be affected by wind speed and wind direction. (Wind speed will affect the movement of air masses. Wind direction will bring warm air masses or cold air masses.)

6. Discuss students' observations and inferences concerning changes in wind direction and wind speed that occurred each day.

7. Reinforce the importance of weather instruments in predicting and observing weather.

GRADE 2
EARTH SCIENCE

UNIT: Weather
TOPIC: Prediction of Weather Conditions
OUTCOME: 30. Predict weather based on observed weather conditions.

Background

Weather forecasting involves accurate observation and record keeping. Meteorologists evaluate existing conditions and past conditions to forecast weather. Weather forecasters use a variety of weather instruments and data to make accurate forecasts.

This activity requires thirty minutes each day for five days. Access to radio, television, or newspaper weather reports is required.

Prior to the following activity, telephone a local radio station to ask when the morning weather report is broadcast. Check the morning newspaper for a daily weather report. When access to a television is available, determine the time the channel gives a morning weather report.

Prepare a chart for the bulletin board. Divide the chart into sections for temperature, wind direction, wind speed, humidity, barometric pressure, precipitation, and sky conditions. Laminate the chart or use clear, adhesive-backed paper. Provide a grease pencil for students to record daily weather data.

Materials

- Large chart paper for weather and class charts (2)
- Radio, television, or newspaper weather reports
- Grease pencil
- Clear, adhesive-backed paper (optional)
- Chalkboard
- Bulletin board

Procedures

Days One Through Five

1. Ask students to recall weather reports heard on radio or television. Have students reveal information given by the weatherman.

2. List on the chalkboard weather report responses given by students. (Temperature, humidity, sky conditions, amount of rainfall/precipitation, barometric pressure)

OUTCOME 30 (Continued)
Procedures (Continued)

3. Divide the class into five groups. Assign each group one of the following weather conditions:

   a. Temperature
   b. Humidity
   c. Air Pressure
   d. Wind Direction and Wind Speed
   e. Rain and Sky Conditions

4. Instruct students to listen carefully to the weather report on radio or television at the assigned class time.

5. Ask students to copy the weather information for their group.

6. Have students compare newspaper, radio, and television weather data.

7. Ask a different student from each group to write the information on a classroom weather chart each day.

8. At the end of the recording time, discuss the data with the class. Cite comparisons between different data, such as temperature and humidity or air pressure and sky conditions.

9. Ask students to study the data collected and recorded each day.

10. Instruct students to make a forecast (prediction) for the next day of weather conditions based on the current information for the present day.

11. Write the forecast on a class chart.

12. On the next day, compare the class forecast with the weather report for that day.

13. Continue this procedure for five days.

Day Five

Review with students the accuracy of their weather forecasts (predictions) for each day. Emphasize the importance of accurate weather forecasts.

GRADE 2
EARTH SCIENCE

UNIT: Weather
TOPIC: Effects of Seasonal Changes on Plants and Animals
OUTCOME: 31. Examine how plants and animals are affected by seasonal changes.

Background

Plants and animals react differently to seasonal changes. Some animals complete a period of inactivity during the cold winter months (frogs, woodchucks, ground squirrels), while other animals complete a period of partial inactivity (gray squirrels, raccoons, bears, skunks). The partially inactive group of animals awakens on mild winter days and search for food. Some plants are dormant during winter months and bloom in the spring and fall, while other plants bloom during the cold winter season and are dormant during the summer.

This activity requires one thirty-minute class session.

Materials

- Pictures of a variety of plants and animals in different seasons
- Pictures depicting the four seasons, 8" x 10" or larger (1 for each season)
- Chalkboard

Procedures

1. Discuss the four seasons with students.
2. Ask students to describe the characteristics of each season.
3. Have students observe the four seasonal pictures.
4. Instruct students to match the name of a season with a picture depicting that season.
5. Discuss with students changes that occur in plants and animals during different seasons.
6. Ask students to share their observations of changes in plants and animals during different seasons.
7. List the students' observations on the chalkboard. Discuss each observation.
8. Display an assortment of pictures that illustrate seasonal changes in different plants and animals (fall leaves, spring growth of plants, rabbit with white fur, sleeping squirrel).

OUTCOME 31 (Continued)
Procedures (Continued)

9. Ask students to observe the pictures carefully.

10. Instruct students to match pictures of plants and animals with the appropriate seasons.

11. Direct students to explain their reasoning for matching the pictures.

12. Review with students the seasonal changes that take place in both plants and animals.

GRADE 2
EARTH SCIENCE

UNIT: Weather
TOPIC: Relationship Between Altitude and Temperature
OUTCOME: 32. Determine the relationship between altitude and temperature.

Background

The sun emits energy in the form of radiation. Some radiation is reflected into space, a small part is absorbed by the atmosphere, and the remaining radiation is absorbed by the ground. Absorbed radiation provides a warming of the earth. The atmosphere acts as an insulator to hold warmth and to prevent the earth from becoming very cold. At lower altitudes, the air is denser than at higher altitudes because there is more air to "push" molecules closer together; therefore, the temperature is warmer at lower altitudes than at higher altitudes. At higher altitudes, air pressure decreases, molecules move farther apart, and there is less absorbed radiation from the atmosphere and the surrounding ground area to provide warmth. Consequently, the temperature is cooler at higher altitudes than at lower altitudes.

Materials

- Large piece of chart paper

For each student:

- Magazine
- Scissors
- Glue

Procedures

1. Discuss with students the meaning of altitude.

2. Ask students to describe any experiences that they may have had at the top of mountains. Invite students to comment on the temperatures observed at the top of mountains as compared to the temperatures observed at lower altitudes.

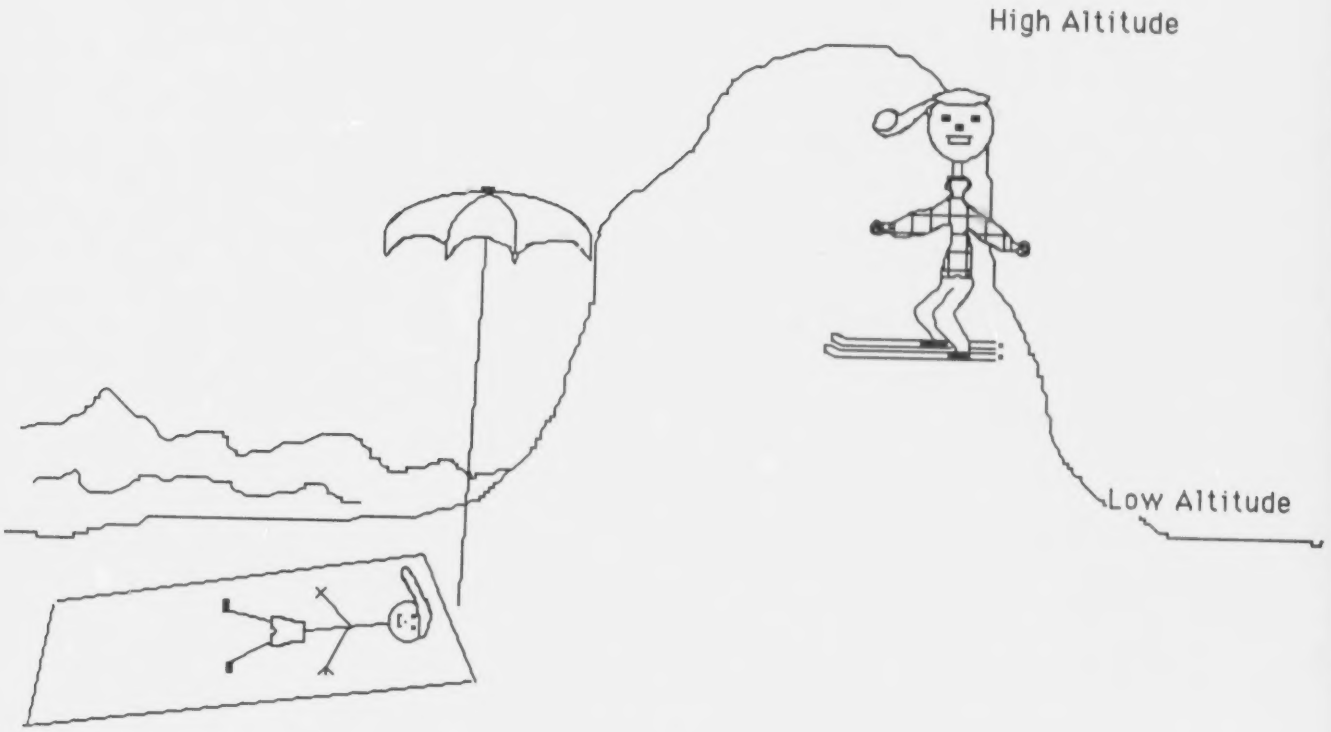
3. Explain to students the relationship between altitude and temperature. (See background information.) Explain why cooler temperatures are associated with higher altitudes and warmer temperatures are associated with lower altitudes.

4. Provide magazines for students.

OUTCOME 32 (Continued)
Procedures (Continued)

5. Tell students to find magazine pictures depicting temperatures at high altitudes (snow skiers on a mountain, people dressed warmly at a lookout point on a mountain) and pictures depicting temperatures at low altitudes (swimmers on a beach).

6. Provide a large piece of chart paper with a drawing similar to the one below.



7. Tell students to cut pictures from magazines of scenes that would be found most commonly either at the top of mountains or at lower altitudes.

8. Direct students to glue their pictures at the most appropriate locations on the chart paper. (High altitude scenes should be located at the top of the chart near the mountain peak. Low altitude scenes should be located at the bottom of the chart near the base of the mountain.)

OUTCOME 32 (Continued)
Procedures (Continued)

9. Instruct students to observe the display of pictures and compare the scenes near the top of the mountain with the scenes near the bottom of the mountain.

10. Discuss student observations.

11. Ask students to describe why the pictures near the top of the mountain indicate that the temperature is colder than at the bottom of the mountain. Draw attention to dress and environmental features, such as snow or beaches that are indicators of temperature.

12. Ask students to make an inference concerning what happens to temperature when the altitude is higher than at the top of a mountain. (The temperature is colder.)

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Reflection and Absorption of Heat and Light
OUTCOME: 33. Demonstrate and observe that light and heat can be reflected or absorbed.

Background

Light and heat are forms of energy that have similar characteristics. Two important characteristics of light and heat are that both can be absorbed and reflected. In this activity, students investigate heat energy to draw the conclusion that heat can be absorbed.

A prerequisite to this activity is that students be able to use an alcohol thermometer to measure the temperature of a material.

Prior to the activity, place one cup of sand in a plastic bag for each group.

This activity requires an hour and fifteen minutes.

Materials

- Dry sponge
- Glass of water
- Tray
- Chalkboard or overhead projector

For each group of three to four students:

- Alcohol thermometer
- Paper cup
- Sand in a plastic bag (1 cup)
- Temperature chart

Procedures

Part A

1. Have students stand in a bright, sunny area in the classroom or outdoors. Ask students how it feels to stand in the sun. Have the class conclude that it is bright (light, sunny) and warm. Help students comprehend the relationship between heat and light.

OUTCOME 33 (Continued)
Procedures (Continued)

2. Display a dry sponge, a tray, and a glass of water. Guide students in making observations concerning the sponge (color, shape, size, texture). List the observations on the chalkboard or overhead projector.

3. Ask students to predict what will happen when a small amount of water is poured onto the top of the sponge. Pour enough water to soak through the sponge but not enough to saturate the sponge.

4. Have students observe the sponge again. Help students focus on the changes that occurred. Introduce and define the term absorb.

5. Ask students to predict whether heat can be absorbed.

Part B

1. Divide students into groups of three to four students.

2. Distribute the materials listed for each group (alcohol thermometer, paper cup, sand, temperature chart).

3. Have a student in each group put the sand into the paper cup and label the cup with the names of the students in the group.

4. Have one student in each group measure the temperature of the sand and record the starting temperature on a group chart similar to the one on page 106.

The bulb of the thermometer should be no more than 1 inch below the surface of the sand.

5. Have each group predict what will happen to the temperature of the sand if the sand is placed in the sun. Have the group record its prediction on the group's chart.

6. Place the paper cups containing the thermometers in a sunny location. Instruct students in each group to take the temperature of the sand every fifteen minutes for one hour. Have students record each temperature measurement on the group temperture charts.

Temperature Chart

Names: _____

_____

_____

_____

Starting temperature:

Temperature after:

1) 15 minutes: 72°F
2) 30 minutes: 75°F
3) 45 minutes:
4) 60 minutes:

Prediction: (The temperature will increase.)

7. Discuss the results of the activity by using questions similar to the following:

   a. What happened to the temperature?
   b. What caused the temperature to rise?
   c. How was the sand like the sponge?
   d. How do you know the heat was absorbed?

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Sources of Heat and Light
OUTCOME: 34. Identify possible sources of heat and light.

Background

Many sources of heat and light are found in the environment. In this activity, students draw from prior experiences and knowledge of heat and light to enjoy an art experience.

Part A and Part B involve the use of brainstorming techniques and the evaluation level of thinking skills. No judgment of ideas should be made during the brainstorming session. All ideas are accepted and recorded. Only after all ideas have been given and recorded does evaluation of ideas begin. Students need to evaluate their ideas, not on the basis of right versus wrong, but on the basis of a variety of criteria, such as practicality, creativity, danger, or usefulness.

Materials

For each group of two to three students:

- Magazines
- Newspapers
- Advertisements
- Glue
- Scissors
- Poster board

Procedures

Part A

1. Make the classroom as dark as possible. Pose the following problem to students:

   The regular lights in our classroom can no longer be used. Other than turning on the regular lights, what would you suggest to provide light in the classroom?

2. Brainstorm with the class all possibilities for providing light in the classroom. Compile a list of any possibility mentioned no matter how farfetched or outlandish.

3. After all possibilities have been listed, illuminate the classroom and review the list.

OUTCOME 34 (Continued)
Procedures (Continued)

4. Help students evaluate their suggestions by categorizing the most practical, unusual, dangerous, and creative ideas. Help students determine the best idea to use in the classroom.

Part B

1. Pose the following problem to students:

   It is going to be very cold tonight. I am not certain what I can do to make my house warm. How many ways can you suggest to provide warmth for my house tonight?

2. Brainstorm with the class all of the possibilities for making a house warm. Make a list of all possibilities no matter how unusual, dangerous, or impractical.

3. After all possibilities have been listed, help students evaluate their suggestions by categorizing the most practical, unusual, dangerous, and creative ideas. Help students determine the best idea to use in providing warmth for a house.

Part C

1. Provide groups of two to three students with the following materials: magazines, newspapers, advertisements, glue, scissors, and poster board. Have each group make a collage of either sources of light or sources of heat.

2. After the collages have been completed, have the groups display and discuss their work.

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Sources of Heat and Light
OUTCOME: 35. Explain that the earth receives heat and light from the sun.

Background

Sources of heat and light are found everywhere in the environment. Electricity is an artificial source of heat and light, while the sun is a natural source of heat and light.

In this activity, the concept of the sun as the ultimate source of heat and light on Earth is reinforced. Students are required to measure temperature in the sunshine and shade outside.

A prerequisite to this activity is that students know how to read a thermometer.

Materials

- Chalkboard or overhead projector

For each pair of students:

- Alcohol thermometer
- Handout: DATA COLLECTION SHEET

Procedures

1. Discuss with students the differences between day and night. Emphasize the fact that the sun is visible during the day but not at night.

2. Discuss some of the differences between days that are bright and sunny and days that are cloudy. Emphasize that the visibility of the sun causes differences in the amount of light. Stress that the visibility of the sun can also affect temperature.

3. Ask students to describe the differences in temperature between a sunny location and a shady location. Record the students' responses on the chalkboard or overhead projector. (It will be colder in the shade.)

Procedures (Continued)

4. Divide the class into teams of two students per team. Give the following directions:

   a. Measure the temperature of the air in a sunny location. Record the temperature on the handout DATA COLLECTION SHEET.

   b. Select three shady locations in the school yard.

   c. Measure the temperature of the air in each of the shady locations. Record the temperature of each shady location on the handout DATA COLLECTION SHEET.

   NOTE: Caution students to be careful in using thermometers so that the glass does not break. Emphasize that students should report to the teacher if a thermometer breaks. If a thermometer breaks, care should be taken to dispose of the broken glass.

5. After completing the activity, ask students to express verbally the differences between the temperatures found in the sunshine and the shade.

6. Help students conclude that temperatures are warmer in the sunshine than in the shade.

7. Help students conclude that the reason for the differences in temperature is the factor of heat from the sun.

DATA COLLECTION SHEET
Handout

Date: _____

Names: _____

_____

_____

1. Temperature in a sunny location:

Location: _____ Temperature: _____

2. Temperature in shady locations:

a. Location: _____ Temperature: _____

b. Location: _____ Temperature: _____

c. Location: _____ Temperature: _____

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Sources of Heat and Light
OUTCOME: 36. Identify sources of natural and manmade light.

Background

Light sources are found everywhere in the environment. It is difficult to classify light sources into natural sources or manmade sources. In order to facilitate classification of light sources into the categories natural and manmade, the following definitions are suggested:

> **NATURAL** sources of light are defined as those which come directly from the sun (or other star), from solar energy stored in chemical forms (wood, wax, coal), or from naturally occurring weather phenomena (lightning).
>
> **MANMADE** sources of light are those derived from electricity.

Students should investigate sources of light in the environment prior to the activity.

Materials

- Poster board (2 sheets)
- Glue
- Chalkboard or overhead projector

For groups of two or three students:

- Magazines
- Advertisements
- Scissors

Procedures

1. Ask students to imagine what it would be like to live in a place that is dark all of the time. Discuss tasks that would be difficult to complete in the dark (eat, dress, read).

2. Brainstorm with students to produce a list of light sources. List all contributions on the chalkboard or overhead projector.

Procedures (Continued)

Separate the sources of light contributed into two lists: one of natural sources and a second of manmade sources. Do not name or label the lists at this time.

sun	traffic lights
moon	desk lamp
stars	Christmas tree lights

3. Ask students to look at the first list (above) and decide what the items have in common (located outdoors, not made by people). Give this list the label NATURAL, and discuss what is meant by this term.

NATURAL	
sun	traffic light
moon	desk lamp
stars	Christmas tree lights

4. Ask students to observe the second list (above) and decide what the items have in common (made by people, some located inside). Give this list the label MANMADE, and discuss what is meant by this term.

NATURAL	MANMADE
sun	traffic light
moon	desk lamp
stars	Christmas tree lights

5. Divide the class into groups of two or three students. Distribute the listed materials to each group.

6. Have students in each group cut from magazines and advertisements one or more pictures of natural and/or manmade sources of light.

7. Label one poster board NATURAL and the other poster board MANMADE.

8. Have students glue the pictures on the appropriate poster boards to make collages.

9. Display the collages in the classroom.

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Materials That Transmit Light
OUTCOME: 37. Classify objects according to ways they transmit light.

Background

Objects can be classified into three groups based on how well light passes through those objects. Objects that allow light to pass through easily and that provide clear views of anything placed on the opposite sides of the objects are classified as transparent. Objects that do not allow light to pass through and do block the view of objects on the opposite side are classified as opaque. Objects that allow the transmission of some light and that provide a fuzzy or unclear view of objects on the opposite side are classified as translucent. Common objects at home or in the classroom can be found in each of the three categories.

Prior to this activity, prepackage the materials for each group in a large plastic bag, a paper bag, or a shoe box.

Materials

(All items the same size)
- Cardboard
- Wax paper
- Clear plastic wrap
- Chalkboard or overhead projector

For each group of two or three students:

- Plastic bag, paper bag, or shoe box

(All items the same size)
- Cardboard
- Clear plastic wrap
- Aluminum foil
- Typing paper of various weights
- Construction paper
- Poster board
- Tablet or notebook paper
- Plastic sheets
- Any other available objects that can be classified by light transmission

Procedures

1. Display the cardboard and the clear plastic wrap. Ask students how these materials are different. Emphasize the characteristic of being able to see through the plastic wrap but not through the cardboard.

OUTCOME 37 (Continued)
Procedures (Continued)

2. Show the wax paper. Ask students how the wax paper differs from the cardboard and the plastic wrap. Emphasize that the image seen through the wax paper is fuzzy or unclear.

3. Distribute the listed materials to each group. Have students work in groups to classify the objects into three categories: "Like plastic wrap," "Like wax paper," Like cardboard."

4. After the objects have been classified, record the results on the chalkboard or overhead projector by using a chart similar to the following:

Like plastic wrap	Like wax paper	Like cardboard
Glass	Plastic sheet	Foil

5. Discuss how all of the objects in a single category are alike. (All of the objects in the "Like plastic wrap" group can be seen through easily.)

6. Change the chart headings to show the common characteristics as stated by the students:

See through easily	See through a little	Cannot see through
Glass	Plastic sheet	Foil

7. Introduce the terms transparent, translucent, and opaque. Use the common characteristics noted by the students in step six as the definitions for the terms. Add the scientific terms to the chart:

Transparent	Translucent	Opaque
Glass	Plastic sheet	Foil

8. Ask students to name other items that conform to the categories "transparent," "translucent," and "opaque." List the additional items on the chart.

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Materials That Transmit Light
OUTCOME: 37. Classify objects according to ways they transmit light.

Background

Objects in the environment may be classified by their ability to transmit light. Transparent objects allow light to pass through easily and, therefore, allow objects on the opposite side to be seen easily. Opaque objects do not allow for the passage of light. Opaque objects block the light and, therefore, easily form shadows. Translucent objects allow some light to pass through and, therefore, provide a fuzzy view of objects on the opposite side.

Part A involves opaque objects and their ability to cast shadows by blocking light. Part B involves classifying objects according to ways they transmit light.

Caution students to be careful when using flashlights. Explain that students should neither look directly at the light nor shine the light directly into the eyes of another student.

Part A

Materials

- Chalkboard or overhead projector

For each group of two or three students:

- Flashlight
- Ball
- Cubic block
- Rectangular block
- Plastic egg or other egg-shaped object
- Soup can

For each student:

- Drawing paper
- Scissors
- Handout: SHADOW CHART

Procedures

1. Demonstrate how to make a shadow by placing an object between the beam of light from a flashlight and the wall of the room.

OUTCOME 37 (Continued)
Procedures (Continued)

2. Ask students to predict whether all objects will have a shadow of the same shape. Record the prediction on the chalkboard or overhead projector.

3. Divide the students into groups of two or three students.

4. Distribute the listed materials to each group and to each student. Give the following directions:

   a. Starting with the ball, make a shadow. Draw the shape on the handout SHADOW CHART.

   b. Make shadows with the other objects to experience the variety of shadows that can be made. Draw the shapes on the chart. Use the objects on the handout SHADOW CHART in the following order: cubic block, rectangular block, plastic egg, and soup can.

   c. Draw a different shape or object on the drawing paper. Cut out the drawing. Find out what shadow the cutout makes. Draw the shape of the shadow on the handout SHADOW CHART.

5. Discuss with students the various shapes seen in the shadows.

   a. Return to the prediction made by the students. Determine whether the prediction was correct.

   b. Define the term opaque. Include in the definition the ideas that light cannot pass through the object and that shadows are cast.

   c. Solicit from students examples of other opaque objects.

   d. Solicit from students examples of objects that are not opaque.

SHADOW CHART
Handout

Ball	Cubic Block	Rectangular Block
Plastic Egg	Soup Can	My Object

OUTCOME 37 (Continued)

Part B

Materials

For Learning Center 1:

- Wax paper, 12" x 12"
- Poster board, 12" x 12"
- Clear plastic tumbler
- Thin cloth, 12" x 12"
- Poster board mounts (4)
- Flashlight
- DIRECTIONS CARD

For each student:

- Handout: TRANSMITTING LIGHT (Learning Center 1)

For Learning Center 2:

- Plastic wrap, 12" x 12"
- Aluminum foil, 12" x 12"
- Clear plastic jar
- Typing paper (1 sheet)
- Poster board mounts (4)
- Flashlight
- DIRECTIONS CARD

For each student:

- Handout: TRANSMITTING LIGHT (Learning Center 2)

Procedures

1. Prepare two learning centers:

    a. Prepare the wax paper, thin cloth, plastic wrap, aluminum foil, and typing paper by taping them to poster board mounts.

    b. Place listed objects in the appropriate center.

    c. Place one flashlight in each center.

    d. Place handouts in each center.

    e. Display a DIRECTIONS CARD in each center.

Procedures (Continued)

2. Explain the information on the DIRECTIONS CARD to the students.

DIRECTIONS CARD

a. Hold the flashlight in one hand.

b. Hold one mounted object in the other hand.

c. Turn on the flashlight. Hold the light close to the mounted object.

d. Does light pass through the object easily? If so, make a check (✓) by the name of the object and under the heading "Transparent" on the handout TRANSMITTING LIGHT (Learning Center 1 and 2).

e. Does some light pass through the object? If so, make a check (✓) by the name of the object and under the heading "Translucent" on the handout TRANSMITTING LIGHT.

f. Does the object block the light? If so, make a check (✓) by the name of the object and under the heading "Opaque" on the handout TRANSMITTING LIGHT.

3. Allow time for all students to work at both centers.

4. Lead a discussion about the results.

TRANSMITTING LIGHT
Learning Center 1
Handout

Transparent objects: light passes through the objects easily

Translucent objects: some light passes through the objects

Opaque objects: light does not pass through the objects

Learning Center 1

Object	Transparent	Translucent	Opaque
1. Wax paper			
2. Poster board			
3. Clear plastic tumbler			
4. Thin cloth			

TRANSMITTING LIGHT
Learning Center 2
Handout

Transparent objects: light passes through the objects easily

Translucent objects: some light passes through the objects

Opaque objects: light does not pass through the objects

Learning Center 2

Object	Transparent	Translucent	Opaque
1. Plastic wrap			
2. Aluminum foil			
3. Clear plastic jar			
4. Typing paper			

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Applications of Heat Energy
OUTCOME: 38. Demonstrate useful applications of heat energy.

Background

Heat energy is used frequently in daily-living activities. For this reason, students are familiar with sources of heat energy as well as uses of heat energy. This activity builds on previous knowledge of heat energy and uses that knowledge in the development of classification skills. In addition, flexibility in thinking skills and problem-solving techniques are used.

Materials

For each student:

- White drawing paper
- Crayons
- Chalkboard or overhead projector

Procedures

1. Start the activity by brainstorming with students ideas on the many uses of heat. List each idea suggested on the chalkboard or overhead projector.

2. Have students study the list and classify the uses into two or more categories.

3. List the categories and uses of heat on the chalkboard or overhead projector.

AT HOME	AT SCHOOL	OUTSIDE
Baking cookies	Cooking lunch	Cooking over a fire
Drying clothes	Keeping the classroom warm	Heating a swimming pool

OUTCOME 38 (Continued)
Procedures (Continued)

4. Have each student select one use of heat and use drawing paper and crayons to illustrate that use.

5. Classify the students' illustrations according to the categories used in Procedure 3. Ask students to select another way of classifying the pictures (food preparation, housekeeping uses, recreational uses). Reclassify the illustrations according to the new categories. Repeat the reclassifications until students can no longer provide new categories for the illustrations.

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Values and Dangers of Fire
OUTCOMES: 39. Describe how fire is useful and how it is dangerous.

40. Describe safety precautions to be followed in case of fire.

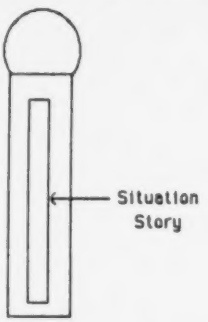
Background

Fire is composed of light and heat that come from a burning substance. Earliest humans used fire to keep warm. Later, humans learned to use fire to cook food, make weapons, provide light, and change clay into pottery.

Presently, fire is used in many ways. Fire furnishes the energy used in many factories and is the energy source used in trains, ships, and airplanes. Fire can generate electricity and can remove harmful bacteria from many foods.

Controlled fire is useful to humans. Uncontrolled fire can destroy property and lives.

A prerequisite to this activity is to cut match stick shapes from poster board or construction paper as shown below. Glue the situation stories on page 126 to the match sticks as shown in Illustration A on page 127. Construct game boards from poster board or construction paper as shown in Illustration B on page 127.



Materials

- Situation cards (match stick shape)
- Game boards (matchbooks)
- Poster board or construction paper
- Chart tablet
- Markers

Procedures

1. Discuss with students the usefulness of controlled fire. Emphasize that fire gives off light and heat, cooks food, forges and shapes metal, generates electricity, and removes harmful bacteria. Lead students in a discussion of ways that an uncontrolled fire is dangerous (destroys property and lives).

2. Instruct students to read the situation cards. Have students place the cards in the correct pockets of the game boards to show if the fires in the situations are useful (controlled) or dangerous (uncontrolled).

Procedures (Continued)

3. Ask students to suggest precautions to implement if trapped by a fire. List the precautions on a chart tablet. Suggestions may include the following:

   a. Never open a door if it feels hot.
   b. During a fire, crawl or keep low on the floor.
   c. If clothes catch fire, stop, drop, and roll.

Situation Stories

a. The electricity is off during a thunderstorm. Your mother uses a candle to provide light in your home.

b. Dad builds a fire in the den fireplace on a cold winter night.

c. Your scout troop goes on an overnight camp out. You cook hot dogs on an open campfire.

d. Your younger brother is playing with matches on his bed, and the sheets catch fire.

e. Your dad stores old paint and gasoline cans near the furnace in the basement. A fire ignites some rags.

f. Your grandmother plugs too may appliances into an outlet in the kitchen. A fire starts.

g. Your father smokes in bed and falls asleep. The bed catches fire.

h. On your birthday, your mother puts eight candles on your cake and lights them with a match.

i. Your neighbor burns leaves in his backyard and goes into the house before the fire is out.

j. At a cookout, you and your family roast marshmallows on a stick over the campfire.

Illustration A

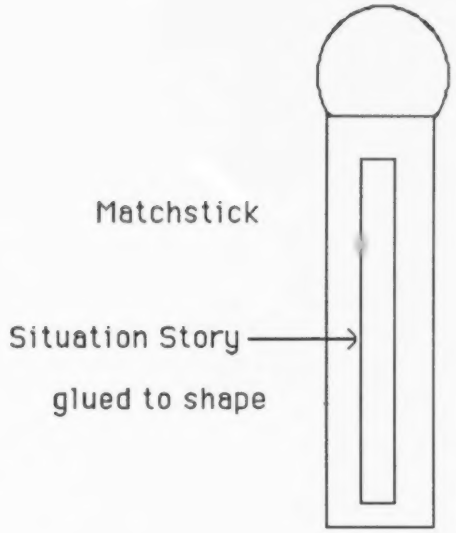
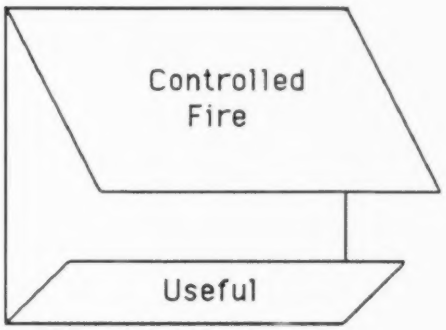


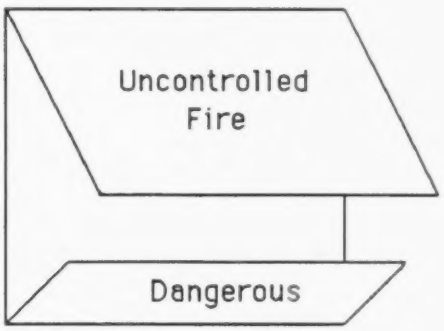
Illustration B

Fold poster board or construction paper to make two matchbooks.

Lable one:



Label other:



GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Values and Dangers of Fire
OUTCOME: 40. Describe safety precautions to be followed in case of fire.

Background

In this activity, the safety precautions to be followed in case of fire can be classified into two categories: how to prevent accidental fires and what to do in case of a fire.

Use the following suggestions for actions in case of fire:

a. Tell an adult. Do not try to put out a fire yourself.

b. If clothing catches fire, roll on the ground. Do not run. It is helpful to roll up in a blanket or coat if clothing catches fire.

c. Move quickly away from the fire.

d. If a fire produces a lot of smoke, drop to the floor and crawl to safety.

e. Telephone the fire department, or go to the nearest fire-alarm box. Wait at the fire-alarm box to direct firemen to the fire.

f. If possible, close the door to the room where the fire is burning.

Use the following suggestions for preventing accidental fires:

a. Keep away from matches.

b. Be certain a match or candle is completely out before discarding it.

c. Place a metal screen in front of a fireplace.

d. Use a metal container to dispose of ashes from a fire.

e. Avoid collecting trash in an attic or basement that will burn.

f. Have a workable carbon dioxide fire extinguisher at home. If there is no fire extinguisher at home, have a blanket and sand to smother a fire.

g. Store flammable materials in metal containers.

h. Do not start a fire of any kind on a windy day.

Background (Continued)

The demonstration included in this activity can be completed safely. Under no circumstances should the students complete this demonstration or participate in the demonstration except as observers.

Place the suggestions listed on page 128 on individual sentence strips or chart paper strips prior to the activity.

Materials

- Metal tray
- Metal pie pan
- Potholder
- Matches
- Sheet of newspaper
- Empty metal can
- Chalkboard or overhead projector
- Sentence strips or chart paper strips

For each student:

- Drawing paper
- Crayons

Procedures

1. Complete the following demonstration:

   a. Clear a table or a desk.

   b. Place a potholder on the table or the desk. Place a metal tray on top of the potholder.

   c. Place a metal pie pan on top of the metal tray.

   d. Crumple a sheet of newspaper. Place the newspaper in the pie plate.

   e. While students watch, light the newspaper with a match. Allow the paper to burn to ash.

   f. Place the used match and the ashes in the metal can.

2. After the paper has burned completely, ask questions similar to the following:

   a. What happened to the paper?

   b. What precautions were taken to make certain the paper could be burned safely?

c. How did you feel while you were watching the paper burn?

d. What would you do if you saw something on fire?

3. Record the answers to Question 2.d. on the chalkboard or overhead projector.

4. Display the suggestions for actions in case of fire previously recorded on sentence strips or chart paper strips. Discuss each of the suggestions with students.

5. Compare the suggestions with the student-generated list on the chalkboard or overhead projector. Emphasize the suggestions that are common to both lists.

6. Ask students for suggestions concerning actions to prevent fires. Record the suggestions on the chalkboard or overhead projector.

7. Display the suggestions for actions to prevent fires previously recorded on sentence strips or chart paper strips. Discuss each suggestion.

8. Compare the student-generated list on the chalkboard or overhead projector with the suggestions on the sentence strips.

9. Have each student select one of the suggestions for actions in case of fire or for preventing fires and illustrate the suggestion on drawing paper. Have each student write the suggestion on the illustration. Display the drawings.

GRADE 2
PHYSICAL SCIENCE

UNIT: Heat and Light
TOPIC: Values and Dangers of Fire
OUTCOME: 40. Describe safety precautions to be followed in case of fire.

Background

Fire safety experts suggest that residents be aware of more than one escape route from a home in case of a fire. The same awareness should be extended to schools so that students can leave the building safely if the major route to safety is blocked by fire or if the students are in a location other than the classroom.

Materials

For each student:

- Drawing paper
- Crayons
- Pencils

Procedures

1. Review with students the rules to follow in a fire drill. Walk with the class along the route to be followed in case of fire.

2. After the usual route of escape from the building has been reviewed, have students plan other possible ways of leaving the school building safely in case of fire if the major escape route is blocked.

3. Have students draw maps or diagrams to represent other possible safe ways of leaving the classroom and the building during a fire.

4. Have the class make a list of other places visited in the school building during the school day. Discuss with students safe routes and safe alternative routes for leaving the building during a fire from the other listed areas.

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Kinds of Magnets
OUTCOME: 41. Identify kinds of magnets: horseshoe, bar, circular, and natural.

Background

Magnets come in a variety of shapes, sizes, and forms. The shapes include horseshoes, rectangles, circles, and cylinders. Sizes range from the tiny magnets used to hold memoranda on refrigerator doors to huge magnets used to move scrap iron in steel mills and junk yards. The forms include manmade magnets, like the familiar bar magnet; natural magnets, commonly called lodestone; and electromagnets, which illustrate the relationship between magnetism and electricity.
The shapes of magnets may be different, but they all possess two common characteristics: All magnets have two poles, and all magnets attract iron, nickel, and cobalt. Steel is often added to this list, but steel is a form of iron and may be included in the category of iron.

Caution students against bumping or dropping magnets. Magnets can be demagnetized as a result of a sharp blow or dropping.

Materials

- Bar magnet
- Circular magnet
- Horseshoe magnet
- Lodestone
- Cylindrical magnet
- Steel paper clips
- Chalkboard or overhead projector

Procedures

1. Display a sample of each type magnet listed in the materials section. Label the magnets in the following manner:

   Bar magnet---------- Object 1
   Circular magnet------- Object 2
   Horseshoe magnet------ Object 3
   Lodestone magnet------ Object 4
   Cylindrical magnet---- Object 5

2. Draw the chart below on the chalkboard or overhead projector.

Object 1	Object 2	Object 3	Object 4	Object 5

OUTCOME 41 (Continued)
Procedures (Continued)

3. Ask students to describe the magnets in their own words. Write the students' description of each magnet under the corresponding object on the chart.

Object 1	Object 2	Object 3	Object 4	Object 5
Rectangle	Circle	Red and gray	A rock	Like a can

4. Show five or six paper clips. Have students predict what will happen if each object is brought near the paper clips. Test the prediction. Include the results on the chart.

Object 1	Object 2	Object 3	Object 4	Object 5
Rectangle	Circle	Red and gray	A rock	Like a can
Picks up paper clips	Picks up paper clips	Picks up paper clips	Picks up paper clips	Picks up paper clips

5. Explain that because all the objects pick up paper clips, all the objects are magnets. Replace "Object 1" and all of the other object designations on the chart with the proper names for the objects.

Bar Magnet	Circular Magnet	Horseshoe Magnet	Lodestone	Cylindrical Magnet

6. Help students draw the conclusion that although the shapes are different, all of the objects are magnets.

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Magnetic Force
OUTCOME: 42. Describe things a magnet can move.

Background

Magnets strongly attract materials made of iron and have a weak attraction for materials made of nickel or cobalt. Since the likelihood of observing the magnetic attraction of nickel and cobalt is remote, iron is the metal that students most commonly find attracted to a magnet. Steel and some other iron alloys are attracted to magnets due to the iron content present in the material.

The conclusion that magnets attract all metals (a common conclusion) is an overgeneralization and an incorrect conclusion. Emphasize to students that a magnet will attract some metals.

Caution students against bumping or dropping magnets. Magnets can be demagnetized as a result of a sharp blow or dropping. Inform students to use iron filings carefully. Although iron filings can be used safely by students at the second-grade level, caution students not to rub their eyes or put their fingers in their ears or mouths. Scratches can occur. Have students wash their hands immediately after the activity.

Since many small objects are used in this activity, prepackaging the materials into egg cartons (with one type of material per section of the carton) will facilitate distribution of the materials.

Materials

For each group:

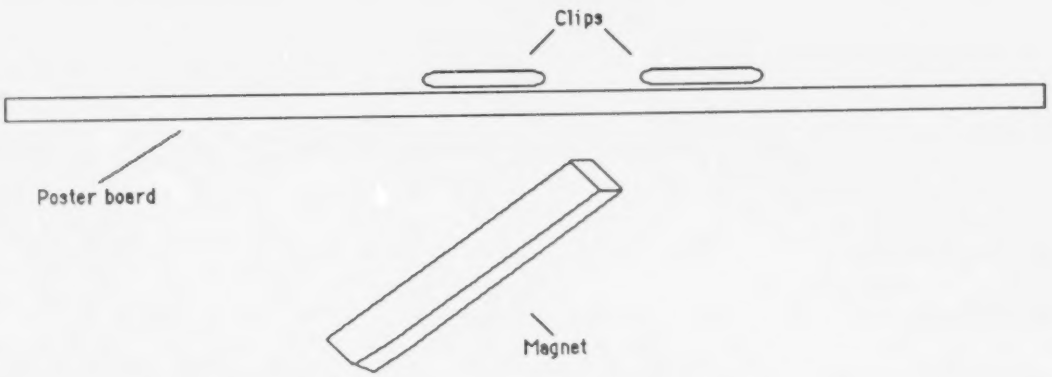
- Poster board, 9" x 12"
- Paper clips (5 to 10)
- Plastic foam packing bits (5 to 10)
- Small pieces of paper (5 to 10)
- Iron filings, 1 tablespoon
- Small pieces of aluminum foil (5 to 10)
- Pieces of string or yarn (5 to 10)
- Pennies (1 or 2)
- Other small objects that may or may not be attracted by a magnet
- Magnet
- Handout: MAGNETIC FORCE
- Chalkboard or overhead projector

OUTCOME 42 (Continued)

Procedures

1. Divide the class into small groups. Give each group the handout MAGNETIC FORCE. Show students a magnet and some paper clips that have been placed on a sheet of poster board. Have students predict what will happen if the magnet is brought close to the paper clips. Have students record their predictions on their handouts. Direct students to test their predictions. Have students record the results of the experiment.

2. Place the paper clips on the topside of the poster board. Have students predict what will happen if the magnet is moved underneath the poster board. Have students test their predictions and record the results of the experiment.



3. Display the remainder of the materials. Give students the following directions:

   a. Predict which materials the magnet will move when the materials are placed on the poster board and the magnet is underneath the poster board. Write your predictions on the handout.

   b. Test your predictions by using the magnet with each of the materials. Test one type of material at a time. Write your results on the handout.

4. After the activity is completed, collect and record on the chalkboard or overhead projector the results similar to the following:

Moved	Did Not Move
Paper clip	Plastic foam packing bits

OUTCOME 42 (Continued)
Procedures (Continued)

5. Discuss the results of the activity with students through their observing what the objects on each list have in common.

6. Help students draw the conclusion that a magnet causes some metals to move.

MAGNETIC FORCE
Handout

Names of
students in group _____

_____

_____

_____

Material	Prediction	What Happened
Paper clips	Will move	Moved
Plastic foam packing bits	Will move	Did not move
Paper		
Iron filings		
Foil		
Yarn		
Pennies		
Other		

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Magnetic Force
OUTCOME: 42. Describe things a magnet can move.

Background

Magnets strongly attract materials made of iron and have a weak attraction for materials made of nickel or cobalt. Since the likelihood of observing the magnetic attraction of nickel and cobalt is remote, iron is the metal that students most commonly find attracted to a magnet. Steel and some other iron alloys are attracted to magnets due to the iron content present in the material.

The results of this activity may place some materials in both the "Attracted by a Magnet" list and the "Not Attracted by a Magnet" list. As an example: a gold ring will not be attracted, while a ring that is steel covered with gold will be attracted. When this duplication occurs, place the item on both lists. After all items are listed, lead a discussion about the items included on both lists.

The conclusion that magnets attract all metals (a common conclusion) is an overgeneralization and an incorrect conclusion. Emphasize to students that a magnet will attract some metals. Avoid the overgeneralization that magnets pick up iron, nickel, and cobalt. Use a textbook or other resource material to determine the exact types of metal attracted.

Caution students against bumping or dropping magnets. Magnets can be demagnetized as a result of a sharp blow or dropping.

Materials

- Magnet
- Paper clips
- Chalkboard or overhead projector
- Textbook or other resource materials

For each pair of students:

- Magnet
- Handout: MAGNETIC FORCE

Procedures

1. Show that a magnet attracts paper clips.

2. Ask students to name other classroom objects that may be attracted by a magnet.

3. List all predictions on the chalkboard or overhead projector.

OUTCOME 42 (Continued)
Procedures (Continued)

4. Pair the students. Give a magnet and the handout MAGNETIC FORCE to each pair of students. Have students find objects that a magnet will and will not attract. Tell students to list the objects on the handout MAGNETIC FORCE.

5. Have students return to their desks. Record the students' data on the chalkboard or overhead projector.

Will Attract	Will Not Attract
Paper clip	Book
Key	Gold ring
Edge of door	Pencil

6. Have students observe the list of objects that were moved or attracted. Have students identify the composition of each item (metal) and add this information to the handout MAGNET FORCE. Emphasize the conclusion that a magnet attracts metal.

Will Attract	Will Not Attract
Paper clip (metal)	
Key (metal)	
Edge of door (metal)	

7. Have students observe the list of items not attracted or moved by the magnet. Have students identify the composition of each item and add this information to the handout MAGNET FORCE. Lead students to the conclusion that a magnet will not attract glass, plastic, metal, or cloth.

Will Attract	Will Not Attract
	Book (paper)
	Gold Ring (gold, metal)
	Pencil (wood)

OUTCOME 42 (Continued)
Procedures (Continued)

8. Lead students to the generalization that a magnet attracts some metals and does not attract other metals.

9. Use a textbook or other resource materials to determine exactly which metals a magnet attracts.

MAGNETIC FORCE
Handout

Names of students _____

_____

_____

_____

Will Attract	Will Not Attract

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Magnetic Force
OUTCOME: 43. Observe that a magnet is strongest at its poles.

Background

A magnet is strongest at its poles. The strength of a magnet decreases toward the center of the magnet. This property of a magnet is most effectively shown with a bar magnet rather than with a horseshoe, circular, or natural magnet. The ends, or poles, of a bar magnet are more clearly observed and are usually marked by using the letters S and N. Consequently, only bar magnets should be used in this activity.

Materials

For the teacher:

- Bar magnet
- Box of steel paper clips
- Chalkboard or overhead projector

For each pair of students:

- Bar magnet
- Paper clips (20 to 30)
- Chart
- Handout: COLLECTION OF RESULTS

Procedures

1. Show students a bar magnet and an open box of paper clips. Pretend to spill accidentally all the paper clips on the floor or a table.

2. Ask students how to use the magnet to collect the spilled paper clips.

   a. Solicit as many ways as possible of using the magnet. Record the suggestions for use of the magnet on the chalkboard or overhead projector.

   b. Try the suggested methods for collecting the spilled paper clips.

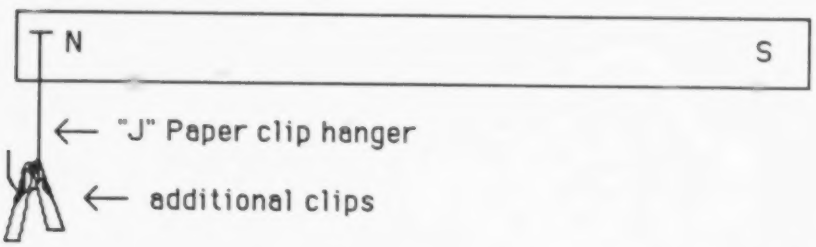
3. Pose the following question:

   Why is the center of the magnet not used to collect paper clips or other items?

4. Divide the class into pairs of students. Distribute the necessary materials to each pair of students. Give the following directions to students:

   a. Make a paper-clip hanger by unfolding the paper clip so that it looks like a capital "J."

   b. Place the "J" paper-clip hanger on the N end of the magnet. Find out how many paper clips can be hung on the "J" paper-clip hanger before it falls. Record the number of paper clips on the handout COLLECTION OF RESULTS.



   c. Repeat Procedure 4.b. for each of the following locations on the magnet:

      1. Between the center and the N end of the magnet
      2. At the center of the magnet
      3. Between the center and the S end of the magnet
      4. At the S end of the magnet

5. Make on the chalkboard or overhead projector a combined list of the data collected by each group.

N End	Near N	Center	Near S	S End
8	2	0	3	7
9	3	0	4	12

6. Help students generalize that the magnet holds the most paper clips at its ends and the fewest at its center. Continue to develop the generalization that the ends of a magnet are stronger than the center of the magnet.

7. Return to the question posed in Procedure 3. Have students answer the question.

COLLECTION OF RESULTS
Handout

N	Center	S

Number of paper clips at N _____

Number of paper clips near N _____

Number of paper clips at the center _____

Number of paper clips near S _____

Number of paper clips at S _____

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Construction of Magnets
OUTCOME: 44. Demonstrate how some nonmagnetic materials can be magnetized.

Background

Ferromagnetic materials are substances, such as iron, nickel, cobalt, and various alloys, that exhibit extremely high magnetic permeability. Ferromagnetic materials may be combined with other elements to form magnets. One example of this combination is the alnico magnet, an alloy of aluminum, nickel, and cobalt.

Ferromagnetic materials can be magnetized by placing them into a strong magnetic field like that produced by a wire coil or by stroking the ferromagnetic material against a magnet. The method of stroking generally produces a weaker magnet than the method of using a magnetic field. The stroking method is the only method of producing a magnet included in this activity. Prior to beginning the activity, instruct stuants in the process of magnetizing ferromagnetic materials by the stroking method.

In this activity, students determine which materials can and cannot be magnetized. Caution students to use needles carefully. A safety procedure would be to use needles with blunt points, such as those used in needlepoint, or to blunt the points of sewing needles with a hammer. Use care in working with iron filings. Tell students not to rub their eyes or put fingers in mouths or ears while working with filings. Direct students to wash hands immediately after working with filings.

Materials

- Bar magnet
- Nonmagnetized iron bar
- Paper clips (1 box)
- Chalkboard or overhead projector

For each pair of students:

- Bar magnet
- Steel needle
- Aluminum nail
- Plastic straw
- Narrow cardboard strip
- Iron filings
- Paper clip that has been straightened
- Uninsulated copper wire, approximately 3"
- Steel screw
- Handout: COLLECTION OF RESULTS

OUTCOME 44 (Continued)

Procedures

1. Show students a bar magnet and a nonmagnetized iron bar. Tell students that one object is a magnet and one object is not a magnet. Ask students to determine which object is the magnet by touching a paper clip with each one. Help students conclude that the object that attracted the paper clip is the bar magnet.

2. Discuss with students that a nonmagnetized object can be made into a magnet. Tell students that stroking an object against a magnet increases its magnetism. Explain to students that the object must be capable of being magnetized for the stroking process to work.

3. Divide the class into pairs of students. Distribute the necessary materials to each pair of students. Give the following directions to students:

   a. Try to collect iron filings with the needle. Record the results on the handout COLLECTION OF RESULTS.

   b. Stroke the needle thirty times along the length of a magnet. Always move the needle in the same direction.

   c. Test the needle to determine if it will collect iron filings. Record the results on the handout COLLECTION OF RESULTS.

   d. Repeat steps "a," "b," and "c" for each of the other materials in the following order:

      1. Aluminum nail
      2. Plastic straw
      3. Cardboard strip
      4. Paper clip
      5. Copper wire
      6. Steel screw

4. Record the results of the experiments on the overhead projector or chalkboard. Discuss the results. Assist students in drawing the following conclusions:

   a. Stroking an object against a magnet will magnetize some materials.

   b. Materials that become magnetized are made from steel.

5. Use a textbook or other resource materials to support the concept that steel is a form of iron.

OUTCOME 44 (Continued)

COLLECTION OF RESULTS
Handout

Names of students _____

_____

Object	Picks Up Iron Filings Before Stroking	Picks Up Iron Filings After Stroking
Steel needle		
Aluminum nail		
Plastic straw		
Cardboard strip		
Paper clip		
Copper wire		
Steel screw		

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Uses of Magnets
OUTCOME: 45. Discover that a compass is a magnet, which can be used to find directions.

Background

The needle of a compass is a magnet. The south pole of a compass needle is attracted by the north magnetic pole of the earth so that the compass needle always points north.

In this activity, the function of the needle of the compass as a magnet is demonstrated by the teacher. Students use a compass to locate objects in the classroom. At the second-grade level, students should be introduced to the cardinal directions of north, south, east, and west. The intermediate points on a compass (northeast, northwest) require more accuracy than most second-grade students are capable of developing. Some second-grade students, however, may be introduced to the intermediate directions as an enrichment activity.

Prior to the activity, have students use the compass to determine the locations of north, south, east, and west in the classroom. Use signs to mark on the walls of the classroom the directions.

Materials

- Signs designating each direction (north, south, east, west), 9" x 12" (4)

For each group:

- Compass
- Sheet of white drawing paper marked with a compass rose to show north, south, east, and west
- Handout: DATA SHEET

Procedures

1. Review the use of a compass by having students use the compass to find the direction north in the classroom. After the north direction has been located, place the identifying sign for north in the appropriate area of the classroom. Repeat the procedure to locate south, east, and west directions.

2. Ask students to predict the direction of various locations in the school (cafeteria, principal's office, playground).

OUTCOME 45 (Continued)
Procedures (Continued)

3. Divide students into small groups. Give each group the handout DATA SHEET, and assign a site within the school to locate and map.

4. Give students the following directions:

   a. Start at the door to the classroom.

   b. Follow the usual route you take when going from your classroom to the site you have been assigned to locate.

   c. Select one member of the group to use the compass to determine the directions.

   d. Select a second member of the group to count the number of steps taken before changing directions.

   e. Select a third member of the group to record the directions and the number of steps on the handout DATA SHEET.

   f. Each time there is a change in direction, record the new direction and the number of steps.

   g. After reaching the assigned site, check the recorded directions and number of steps.

   h. Return to the classroom. Use white paper to draw a map that would enable another person to find your assigned site. Record on the map the directions and the number of steps taken in each direction.

5. After all maps have been drawn, have groups exchange maps. Have groups follow the new maps.

6. Discuss problems that arose in following the maps. Discuss why problems occurred.

DATA SHEET
Handout

Date: _____ Names of Students 1. _____

2. _____

3. _____

1. Place we are going: _____

2. First direction: _____

   Number of steps: _____

3. Second direction: _____

   Number of steps: _____

4. Third direction: _____

   Number of steps: _____

5. Fourth direction: _____

   Number of steps: _____

6. Fifth direction: _____

   Number of steps: _____

GRADE 2
PHYSICAL SCIENCE

UNIT: Magnets
TOPIC: Uses of Magnets
OUTCOME: 45. Discover that a compass is a magnet which can be used to find directions.

Background

Prior to beginning this activity, construct a support stand for a bar magnet. The support stand can be a pendulum stand or can be made by using a dowel rod or a ruler extending over the edge of a desk and supported by books on the desk.

Tie string around the bar magnet so that the bar magnet is suspended from the string and remains horizontal. Tie the opposite end of the string to the support stand or dowel rod. The bar magnet should now be similar to the needle of a compass and should align with the magnetic field of the earth. With less metal, particularly iron or steel, around the magnet and the support stand, the better this demonstration will exemplify the concept.

Prior to beginning this activity, use the compass to determine the locations of north, south, east, and west in the classroom.

Materials

- Bar magnet
- Support stand
- String, 18"
- Compass
- Signs designating each direction (north, south, east, west), 9" x 12" (4)
- Chalkboard or overhead projector

Procedures

1. Ask students to pretend they are participating in a camping trip and have become lost in the woods. Have students decide what is available to help them find their way back to camp. Ask students to pretend that one student in the class has a magnet. Ask students how the magnet can be used to find the way back to camp.

2. Discuss ideas given by students to use a magnet to find their way back to camp.

3. Show students the magnet and stand. Allow the magnet to move freely until it comes to a stop. Ask students to name the direction in which the magnet is aligned.

OUTCOME 45 (Continued)
Procedures (Continued)

4. Show students the compass. Tell students that the needle in the compass is a magnet. Point out that the compass is marked with the directions north and south. Show students that the compass needle and the magnet are aligned in the same direction.

5. Place the direction signs in the classroom to indicate the directions north, south, east, and west.

6. Ask students to give examples of items that are toward the northern direction of the classroom. On the chalkboard or overhead projector, list the items under the category north.

7. Repeat Procedure 6 for items to the south, east, and west.

8. Conclude the activity by naming items in the classroom. Have students record in which direction the classroom items are found.

GRADE 2
PHYSICAL SCIENCE

UNIT: Matter and Energy
TOPIC: Chemical Energy
OUTCOME: 46. Identify an example of chemical energy being changed into mechanical energy.

Background

Chemical energy is stored in materials and released as a result of a chemical change. Energy released from burning wood, from food as it is digested, and from gasoline as it burns is all the result of chemical change. All of these forms of chemical energy can be changed into mechanical energy, that is, into energy of motion.

The kinds of chemical energy that are used to produce mechanical energy and other forms of energy are generally termed fuels.

Prior to implementing this activity, students should understand the differences between chemical energy and mechanical energy.

Materials

- Canned heat
- Small tea pot with small diameter spout
- Small paper windmill (Refer to the handout WATER WHEEL on page 73.)
- Water
- Matches

Caution: Teacher should handle fuel and matches.

Procedures

1. Use the matches to light the canned heat. Discuss the chemical energy being released from the fuel.

2. Pour a small quantity of water into the tea pot, and heat the water with the burning canned heat.

3. While the water in the tea pot is coming to a boil, make a small paper windmill.

4. Heat the water until a strong, steady flow of steam comes from the spout of the tea pot. Caution students not to place their hands or faces in the flow of steam.

5. Place the windmill in the flow of steam. Have students observe the turning windmill. Explain to students that this process is an example of mechanical energy.

GRADE 2
PHYSICAL SCIENCE

UNIT: Matter and Energy
TOPIC: Principle of Displacement
OUTCOME: 47. Infer reasons objects sink or float.

Background

This activity focuses on the investigation of objects, the classification of those objects into the categories of sink and float, and the development of multiple inferences about the causes of sinking and floating. Because inferences can often be tested by using materials, the process of prediction may also be used.

Buoyancy is the name given to the force that pushes an object upward and makes it seem to lose weight in a fluid. In order to determine which objects float in water while others sink, the amount of force exerted by the fluid must be known. This is identified by the strength of the buoyant force compared to the weight of an object. Archimedes discovered that the buoyancy of any object is equal to the weight of the liquid that the object displaces, or pushes aside. This relationship between buoyancy and the weight of the fluid being displaced is known as Archimedes' principle.

Since the buoyant force acts upward, it opposes the downward force of the weight of the object. If the buoyant force is equal to the weight of an object, then the object will float.

Part A

Materials

- Large basin of water
- Ball of clay
- Chalkboard or overhead projector

For each group:

- Large basin of water
- Newspaper
- Ball of clay, 2" to 3" in diameter
- Pennies (20-30)

Procedures

1. Ask students how many of them have traveled by boat on a lake, a river, or an ocean. Discuss with them their experiences with boats and the capacity of boats to carry people and cargo.

Procedures (Continued)

2. Show students a ball of clay and a basin of water. Ask students to predict whether the ball of clay will sink or float. Have a student place the clay in the basin of water. (The ball of clay will sink.)

3. Ask students what could be done to make the clay float. List the suggestions on the chalkboard or overhead projector.

4. Divide the class into small groups. Distribute the materials listed for each group. Challenge each group to find a method that makes the clay float. Give an additional challenge to each group to find a method that makes the clay float while holding a cargo of pennies.

5. Allow time for students to work freely with the clay to find a method to make the clay float and to find a method to allow the clay to hold a cargo of pennies.

6. Have students save their "boats" to show classmates at the conclusion of the activity.

7. Focusing on shape and size, discuss with students some of the characteristics of the clay "boats".

Part B

Materials

For each group:

- Large basin of water
- Paper clip
- Marble
- Plastic packing material
- Wooden block
- Penny
- Piece of cardboard, 3" x 5"
- Plastic film can
- Pencil
- Group of four sections from an egg carton
- Screw
- Ball of clay
- Nail
- Handout: DATA COLLECTION SHEET

Procedures

1. Ask students to indicate if they like to swim in the summertime. Ask whether they sink or float in water.

2. Tell students that this activity provides an opportunity to discover if things float in water.

OUTCOME 47 (Continued)
Procedures (Continued)

3. Divide the students into small groups. Distribute the materials listed for each group. Give the following directions to each group:

   a. Observe each object provided. Predict whether the object will float or sink in water. Record the prediction on the handout DATA COLLECTION SHEET.

   b. Place the objects into water one at a time. Record whether the object sank or floated on the handout DATA COLLECTION SHEET.

   c. Observe all objects that floated. Ask students to tell what the floating objects have in common. Have students discuss this question with partners. Record each idea on the handout DATA COLLECTION SHEET.

4. Discuss with the class the characteristics that the floating items have in common.

5. Have students focus on the idea that the big, light-weight objects floated.

OUTCOME 47 (Continued)

DATA COLLECTION SHEET
Handout

OBJECT	PREDICTIONS (Circle your predictions)		WHAT HAPPENED (Circle what happened)	
Paper clip	Float	Sink	Float	Sink
Marble	Float	Sink	Float	Sink
Packing material	Float	Sink	Float	Sink
Block	Float	Sink	Float	Sink
Penny	Float	Sink	Float	Sink
Cardboard	Float	Sink	Float	Sink
Film can	Float	Sink	Float	Sink
Pencil	Float	Sink	Float	Sink
Egg carton	Float	Sink	Float	Sink
Screw	Float	Sink	Float	Sink
Clay	Float	Sink	Float	Sink
Nail	Float	Sink	Float	Sink

Things in common to everything that floated:

_____

_____

_____

_____

_____

GRADE 2
PHYSICAL SCIENCE

UNIT: Matter and Energy
TOPIC: Prediction of Experiment Outcomes
OUTCOME: 48. Hypothesize the outcome of an experiment.

Background

A hypothesis is generally defined as a theory. A hypothesis is usually worded in the following format: If...(certain conditions or circumstances exist...) then...(followed by a prediction). The term hypothesis may also be defined as an educated guess or a statement to be proven wrong. The definition of a hypothesis as an educated guess is the one most appropriate for this activity.

An educated guess may be equated with a prediction. A prediction should not be judged on the basis of whether it is right or wrong but on the basis of whether it is a logical attempt to infer what will occur and is based on previous experience.

Each of the three parts of this activity takes one class period to complete.

Part A

Materials

- Blue food coloring
- Jar of warm water
- Jar of cold water
- Jar of vinegar
- Jar of cooking oil
- Jar of clear corn syrup
- Chalkboard or overhead projector

For each group:

- Food coloring in dropper bottles: red, yellow, blue, green
- Jar of water
- Jar of cooking oil
- Jar of clear corn syrup
- Jar of vinegar
- Handout: DATA COLLECTION SHEET

Procedures

1. Display the jar of warm water, the jar of cold water, and the blue food coloring. Ask students to predict what would happen if two or three drops of food coloring were put into each of the jars of water. Record the predictions on the overhead projector or chalkboard.

Procedures (Continued)

2. Test the predictions by placing two or three drops of food coloring into the warm water. Have students observe the outcome.

3. Repeat Procedure 2 with the cold water.

4. Have students compare the observations of food coloring added to warm water with food coloring added to cold water.

5. Present the jars of vinegar, cooking oil, and corn syrup. Have students make observations of the liquids. Compare each of the liquids with water.

6. Have students predict what would occur if drops of food coloring were placed into the jars of vinegar, cooking oil, and corn syrup. Record the predictions on the chalkboard or overhead projector.

7. Distribute the materials listed for each group. Allow students time to explore the effect of food coloring in the various liquids. Have students use the handout DATA COLLECTION SHEET to draw pictures or record in words the most interesting occurrences observed.

8. Collect all materials. Have students share their observations with classmates.

9. Return to the predictions recorded on the chalkboard or overhead projector. Discuss the accuracy of the predictions with the students. Include in the discussion some of the reasons why inaccurate predictions were made.

Part B

Materials

- Gallon jar
- Quart jar
- Pint jar
- Half-pint jar
- Jars of sizes other than those listed above (2)
- Birthday candles (6)
- Metal tray
- Clay
- Matches
- Container of water
- Large clock with a second hand
- Chalkboard or overhead projector

OUTCOME 48 (Continued)

Procedures

Part B of the activity is presented as a teacher demonstration because of the use of glass jars and an open flame. In order to control as many variables as possible, a new candle should be used with each jar.

1. Display the materials. Stick the clay, to be used as a candle holder, to the center of the metal tray. Place the first birthday candle in the clay. Have the container of water near so that used matches can be placed into the water immediately.

2. Show the gallon jar to students. Ask students to predict what will happen if the candle is lighted and the jar is put over the candle. Place the jar over the lighted candle.

3. Ask students to estimate how long it will take for the candle to be extinguished in the jar. Record all estimates on the chalkboard or overhead projector.

4. Repeat the demonstration. Record the length of time taken for the candle to be extinguished in the gallon jar.

5. Show the smallest of the jars. Ask students how long it will take for the candle to be extinguished in the smallest jar. Record all predictions on the chalkboard or overhead projector.

6. Test the prediction by lighting the candle, placing the smallest jar over the candle, and recording the length of time for the candle to be extinguished.

7. Draw the conclusion that the candle extinguishes faster in a smaller jar than in a larger jar.

8. Show the remainder of the jars in a random order. Have students predict the order in which the candle will be extinguished in the jars. Have students place the jars in order from the jar that will cause the candle to be extinguished in the longest amount of time to the jar that will cause the candle to be extinguished in the shortest amount of time.

9. Record the order of jars predicted on the chalkboard or overhead projector. Test the prediction by completing the experiment with each jar. Time and record the number of seconds taken for each candle to be extinguished.

Procedures (Continued)

10. Discuss the accuracy of the prediction. If the prediction was not accurate, discuss some of the reasons that could have made the prediction different from the results.

Part C

Materials

- Thick rubber bands
- Thin rubber bands
- Chalkboard or overhead projector

For each group:

- Assortment of rubber bands of various lengths and thicknesses
- Handout: DATA COLLECTION SHEET

Procedures

1. Show the thick and thin rubber bands to students. Ask students to list ways in which the rubber bands could be used to produce sounds. Record the suggestions on the chalkboard or overhead projector.

2. Experiment with some of the suggestions. Ask students if anyone noticed differences in the sounds produced by the rubber bands. Record on the chalkboard or overhead projector the differences noticed.

3. Show other kinds of rubber bands to be used in the activity. Have students make predictions concerning the kinds of sounds the rubber bands will produce. Have students predict how the thickness of a rubber band or the stretch of the rubber band will affect the sound.

4. Distribute the rubber bands to students. Have students work freely to test the effects of stretch and thickness on the sounds produced by the rubber bands. Have students record in pictures or words on the handout DATA COLLECTION SHEET the results of the experiment.

5. Discuss the previous predictions. Discuss the accuracies of the previous predictions. If the predictions were not accurate, discuss reasons for the inaccuracies.

OUTCOME 48 (Continued)

DATA COLLECTION SHEET
Handout

Date: _____

Name: _____

1. What I tried:

   What happened:

---

2. What I tried:

   What happened:

---

3. What I tried:

   What happened:

---

4. What I tried:

   What happened:

GRADE 2
CONTRIBUTIONS AND CAREERS IN THE FIELDS OF LIFE SCIENCE, EARTH SCIENCE, AND PHYSICAL SCIENCE

UNIT: Contributions and Careers in Science
TOPIC: Contributions of Scientists
OUTCOMES: 49. Identify men and women who have contributed to the fields of Life Science, Earth Science, and Physical Science.

50. Describe what men and women have done in the fields of Life Science, Earth Science, and Physical Science.

51. Explain why an understanding of Life Sciences, Earth Sciences, and Physical Sciences can contribute to the quality of life in today's and tomorrow's societies.

TOPIC: Career Opportunities
OUTCOMES: 52. Identify careers related to an understanding of Life Sciences, Earth Sciences, and Physical Sciences.

53. Explain how careers depend on a basic understanding of Life Sciences, Earth Sciences, and Physical Sciences.

Background

The goal of science education should be to develop scientific literacy through a balanced science curriculum that prepares students to (1) pursue further studies in science and technology, (2) participate in a technological society of informed citizens, (3) enter the modern work world, and (4) develop intellectually and morally to their fullest. ("The New Basic in Education: Sciencing," taken from an interview given by Dr. Gerald Krockover, Professor of Geosciences and Education, Purdue University.)

Building more realistic images of scientists may help students become interested in choosing careers in science. The stereotypical image of a scientist as a man in a white lab coat must be broadened. A scientist may be a parent, a neighbor, or a teacher. In short, a scientist is anyone who studies a problem by using the scientific method of research in gathering data, conducting experiments, making observations, and testing results.

Biographical data on scientists included in this section of the curriculum guide may be helpful with activities that address contributions and careers in the fields of Life Science, Earth Science, and Physical Science. Biographical data may be expanded to include many other scientists. The information about each scientist may be stored in a biographical data file.

Background (Continued)

The procedures below describe how to construct a biographical data file.

Materials

- Shoe box
- Adhesive-backed paper
- Large index cards, 5" x 8"
- Tabs or markers
- Handout: SCIENCE BIBLIOGRAPHY CARDS

Procedures

Make a biographical data file of famous scientists. Transfer the biographical data of scientists from the handout SCIENCE BIBLIOGRAPHY CARDS onto 5- by 8-inch index cards. Separate the index cards into three categories: Life Sciences, Earth Sciences, and Physical Sciences. Use tabs to indicate category separations, or use markers to color-code corners of the index cards (Life Sciences--red, Earth Sciences--blue, Physical Sciences--green). Cover a shoe box with colorful adhesive-backed paper. Use the shoe box as a container for the biographical data cards. Use the biographical data file with each activity concerning contributions and careers of scientists. Prior to beginning this activity, have all students observe all of the SCIENCE BIBLIOGRAPHY CARDS.

Background

Many men and women from countries around the world have made notable contributions to the various science fields. Scientists have identified, described, named, and classified animals and plant species; assessed characteristics and functions for things in the world; and discovered theories, explanations, causes, and cures.

Some discoveries have been detrimental to conditions of health and safety, and other inventions have enhanced lifestyles and living conditions in society. Confidence, determination, and skill in the exploration of the environment are qualities exhibited by these scientists. Who are they and what have they done for society?

The following activity acquaints students with some of these noted scientists and their contributions. Before using this activity, prepare a display table by using the information on the SCIENCE BIBLIOGRAPHY CARDS included in this activity to collect items or pictures of representive inventions or contributions by the scientists. Prepare these and other bibliography cards to correlate with the various inventions or contributions. Place the bibliography cards on the display table in random order along with the items or pictures collected.

Materials

- Nylon hosiery (Carothers)
- Peanuts and by-products: Peanut butter, soap, lotion, and so on (Carver)
- Globe (Copernicus)
- Bird pictures (Audubon)
- Animal and plant pictures (Aristotle)
- Halley's Comet pictures (Halley)
- Plant (Hales)
- Straw (Harvey)
- Lightning rod pictures (Franklin)
- Medicine dropper (Jenner)
- SCIENCE BIBLIOGRAPHY CARDS
- Books on scientists

For each student:

Handout: GREAT SCIENTISTS

Procedures

1. Ask students questions similar to the following:

   a. How do we know that dinosaurs lived on earth long ago? (Fossils have been found.)

   b. How do we know that certain medicines will keep us healthy? (Answers will vary. Example: Doctors tell us.)

2. Explain that scientists have helped to answer these and many other questions by observing, experimenting, and searching.

3. Tell students that they are going to identify some famous scientists and discover how those scientists helped society.

4. Have a student read the information from one of the SCIENCE BIBLIOGRAPHY CARDS.

5. Have another student look on the display table for an item or picture that correlates with the information read.

6. Ask students questions similar to the following:

   a. Why do you think the scientist invented the item or investigated certain areas? (Lead students to conclude that scientists either had personal interests or were meeting the needs of society.)

   b. Would society be better with or without the invention?

Procedures (Continued)

7. Explain that the sciences and scientists usually add to the quality of life and make things better through their discoveries and inventions.

8. Ask students to tell how the items on the table or the knowledge and understanding of these items have made life better for society today.

9. Distribute the handout GREAT SCIENTISTS. Have students locate the names of scientists.

10. Have students research and report on scientists who have made discoveries.

Extension

Plan an Invent America Day in which students may brainstorm ideas about inventions to meet various needs. Explain that Invent America is a national program sponsored by the United States Patent Office.

SCIENCE BIBLIOGRAPHY CARDS
Handout

George Washington Carver American Life Scientist 1864-1943 Discovered three hundred uses for the peanut	Wallace Carothers American Chemist 1896-1937 Discovered nylon
Nicolaus Copernicus Polish Astronomer 1473-1543 Developed idea that the earth is a moving planet	Aristotle Greek Philosopher 384 B.C.-322 B.C. Classified living things
Benjamin Franklin American Physical Scientist 1706-1790 Invented the lightning rod	John Audubon French Life Scientist 1785-1851 Established bird-study society
William Harvey English Scientist 1578-1657 First described the circulation of blood through the heart and body	Stephen Hales English Botanist 1677-1761 Discovered that air nourishes plants
Edmund Halley English Scientist 1656-1742 Calculated the orbit for Halley's comet	Edward Jenner British Physician 1749-1823 Developed smallpox vaccination

GREAT SCIENTISTS
Handout

P X N A U D U B O N

C O P E R N I C U S

A N D F X R I A T O

R H A R V E Y R T Z

V O X A T M O O T H

E A C N R Z X T M A

R X A K N L T H P L

M H A L E S U E T L

D F G I G A V R T E

P G I N O N W S S Y

(Stephen) HALES

(William) HARVEY

(Benjamin) FRANKLIN

(Edmund) HALLEY

(George W.) CARVER

(Nicolaus) COPERNICUS

(John) AUDUBON

(Wallace) CAROTHERS

Background

Because science is an integral component of man's existence, an understanding of the Life, Earth, and Physical Sciences is essential to most careers. In addition, some careers are direct extensions of the understanding of science. Components of science may be emphasized in the following manner:

a. A science career day when students dress as persons whose jobs depend on an understanding of the Life, Earth, and Physical Sciences

b. The visit of a doctor, a veterinarian, a farmer, a zoo keeper, or a weatherman to the class to tell what part science plays in his or her career

c. The game NAME THAT CAREER (page 171)

The three components of this activity require a total of two days.

Materials

- Game Cards: NAME THAT CAREER
- Key: NAME THAT CAREER
- Additional teacher-made game cards
- Chalkboard

Procedures

Day One

1. Discuss science careers with students by asking questions similar to the following:

   a. What do you need to know in order to be a zoo keeper? (Animal names, what the animals eat, what kind of environment the animals need, and other facts)

   b. Where would you learn about science careers? (At school, by asking someone and through other sources of information)

   c. In what subject(s) would you most likely study careers? (Science, social studies, and other subjects)

   d. Can you think of any jobs that require studying science? Write students' responses on the chalkboard. Add the following:

      Veterinarian (animals)
      Astronomer (stars, space, planets)
      Weatherman (weather)
      Farmer (animals, plants)

Procedures (Continued)

Physician (living human beings)
Conservationist (natural resources)
Ranger (plants and animals)
Geologist (Earth's surface)
Chemist (Earth's elements)

2. After the careers are written, compare the relationship of the careers with science studies.

Day Two

1. Have a career person share with students the important role of science in his or her career training program.

2. Distribute cards for the game NAME THAT CAREER. Have students play the game by using the following directions:

   a. Choose a card. Read Clue 1 to the class.

   b. Wait for responses. Check the back of the card for the correct response. If responses are incorrect, read the second clue. If responses are still incorrect, allow additional guesses before revealing the correct answer.

   c. Continue in this manner until all careers are guessed.

Extension

Have students dress for chosen careers and report on the role of science education in the training for the selected career. (Research may be necessary. Solicit the assistance of the librarian if possible.)

NAME THAT CAREER
Game Cards

1 Clue 1: I work with plants and animals. Clue 2: I sell products raised in my rural environment.	5 Clue 1: I watch the sky. Clue 2: I record and predict the weather.
2 Clue 1: I work with nurses to fight germs. Clue 2: I help sick people.	6 Clue 1: I work with animals. Clue 2: I help sick animals get well and help healthy animals stay healthy.
3 Clue 1: I carefully observe wildlife. Clue 2: I protect wildlife.	7 Clue 1: I observe and study natural resources. Clue 2: I work to preserve and conserve resources.
4 Clue 1: I use a telescope. Clue 2: I study the sky.	8 Clue 1: I know about hills and mountains. Clue 2: I study the earth's surface.

NAME THAT CAREER
Key

1. Farmer
2. Physician
3. Forest Ranger
4. Astronomer
5. Meteorologist (Weatherman)
6. Veterinarian
7. Conservationist
8. Geologist